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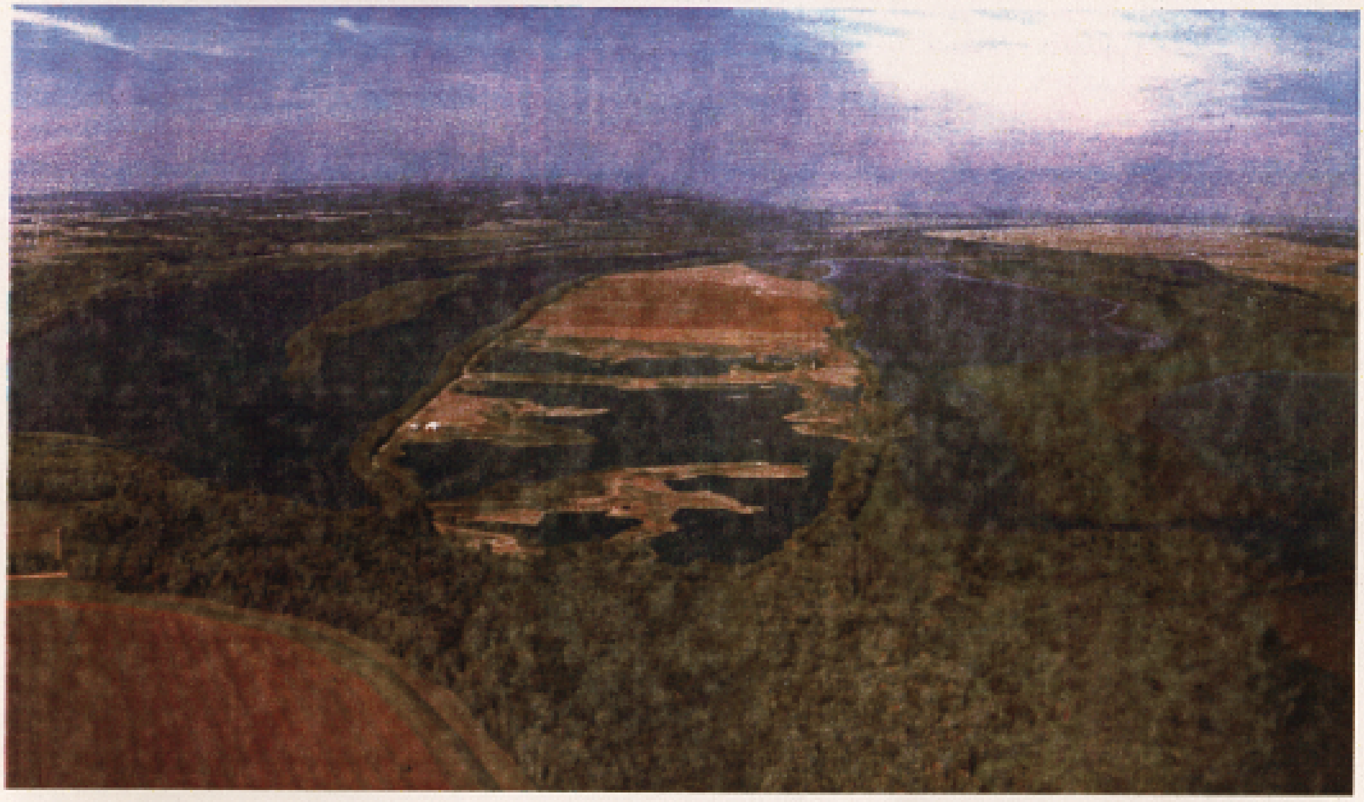
UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17D)

RICE LAKE STATE FISH AND WILDLIFE AREA HABITAT REHABILITATION AND ENHANCEMENT



SEPTEMBER 1997

US Army Corps
of Engineers
Rock Island District

LA GRANGE POOL
ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF:

CEMVR-PD-W

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ENVIRONMENTAL MANAGEMENT PROGRAM
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SEPTEMBER 1997

ACKNOWLEDGEMENT

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US Army Corps of Engineers
Rock Island District

WE'RE PROUD TO SIGN OUR WORK

EXECUTIVE SUMMARY

The 6,800-acre Rice Lake Habitat Rehabilitation and Enhancement Project (HREP) lies on the right descending bank of the Illinois Waterway between River Miles (RM) 132.0 and 138.0, near Banner, Illinois. The project is located in Fulton County, Illinois, approximately 24 miles southwest of Peoria, Illinois. The project area encompasses the land and water areas that comprise the Rice Lake State Fish and Wildlife Area (5,600 acres) and the privately owned Duck Island peninsula (1,200 acres) that is almost completely surrounded by the State owned fish and wildlife area.

The Rice Lake State Fish and Wildlife Area has been managed for migratory birds and other wetland dwelling species since the Illinois Department of Natural Resources (DNR) began purchasing tracts of land in the project area during the 1940s, 1950s, and 1980s. Site management by the State includes operation of a pump station and water control structures to provide reliable food production for migrating birds. The opportunity exists to increase overall preferred habitat quality and quantity by attenuating summer and fall flooding impacts.

The goals of the proposed project are to enhance wetland, aquatic, and terrestrial habitats. The following objectives have been identified to meet these goals: (1) increase success rate of submergent/emergent vegetation; (2) increase food and shelter for wildlife; (3) increase fish egress from Rice Lake during drawdown; and (4) increase food and cover for terrestrial birds and mammals.

Four enhancement features and their associated construction options were considered to achieve the project goals and objectives (the no action option was assessed for each feature):

A. Perimeter Water Control Dike

1. Construct the perimeter dike to a top elevation of 440 with a spillway crest elevation of 438 and two gated outlet structures, which would provide a slight increase in operating flexibility for Rice Lake, but no added protection from river stage fluctuations.

2. Construct the perimeter dike to a top elevation of 442 with a spillway crest elevation of 440 and two gated outlet structures, which would provide a slight increase in operating flexibility for Rice Lake and additional protection from river stages below elevation 440.

B. Water Level Management Capability

1. Construct a pump station with a capacity of 50,000 gpm and conveyance ditches to manipulate Big Lake water levels. The existing pump station would be maintained to manage water levels on Rice Lake.

2. Construct a pump station with a capacity of 100,000 gpm and conveyance ditches to optimize management and operational flexibility for the entire project area. The existing pump station would be abandoned.

C. Terrestrial Habitat Enhancement

1. Acquire Duck Island and plant approximately 200 acres of warm season grasses on existing agricultural fields to diversify herbaceous vegetation in the project area.

2. Acquire Duck Island and plant approximately 200 acres of warm season grasses and 100 acres of mast producing trees on existing agricultural fields to diversify herbaceous vegetation and enhance forest resources by introducing mast species into a forest dominated by silver maple and cottonwood.

D. Fish Egress Structure

1. Acquire Duck Island and install a gated 60-inch-diameter structure between Rice Lake and the quarry pit on Duck Island to allow fish movement to deep water areas during summer drawdown periods.

Evaluation of the project enhancement features and construction options was accomplished through application of the Wildlife Habitat Appraisal Guide (WHAG) and annualization of outputs and costs. The WHAG evaluation methodology quantifies habitat output in the form of habitat units (HUs) that are used in conjunction with project cost data and functional life expectancy to compare the construction options of the proposed enhancement features. This incremental analysis determines which combination of enhancement features would provide the greatest total outputs per unit cost over time.

The recommended plan (shown on Figure ES-1) includes: constructing a perimeter water control dike to a top elevation of 442 with a spillway crest elevation of 440 and two gated outlet structures (A2 above); providing water control capability by constructing a pump station with a capacity of 100,000 gpm and excavating conveyance ditches (B2); enhancing terrestrial habitat by planting 200 acres of warm season grasses and 100 acres of mast producing trees on Duck Island (C2); and installing a gated 60-inch-diameter fish egress structure between Rice Lake and the gravel pit on Duck Island (D1).

Construction of the perimeter dike would protect interior areas from frequent Illinois River stage fluctuations during the critical growing season for moist soil food plants. The spillway would protect the perimeter dike from erosion by equalizing water levels on either side of the dike during flood events. Constructing a pump station and conveyance ditches would allow water level manipulation (timely flooding and drawdowns) that is crucial to improving the success rate of submergent/emergent vegetation and their eventual use by migrating birds. The planting of warm season grasses and mast trees on Duck Island would create habitat diversity and provide food and cover for terrestrial birds and mammals. Installing a fish egress structure would increase fish survival by making deep water areas available to fish during summer drawdown periods and reduce the incidence of avian botulism associated with frequent fish kills.

Construction would be accomplished in two phases. Phase I construction would include the perimeter water control dike improvement. Phase II would include pump station construction, warm season grass plantings, mast tree plantings, and fish egress structure improvements and is contingent upon Illinois DNR's purchase of Duck Island.

Implementation of the recommended plan would provide increased management flexibility and the capability to optimize the quality and quantity of preferred habitat at this location. The project outputs meet Illinois DNR site management goals and objectives and support the overall goals and objectives of the Upper Mississippi River System-Environmental Management Program (UMRS-EMP), the North American Waterfowl Management Plan, and the Partners in Flight Program.

Per section 107(b) of the 1992 Water Resources Development Act (WRDA), project operation and maintenance, at an estimated average annual cost of $15,290 would be accomplished by the Illinois DNR, the non-Federal project sponsor.

The U.S. Army Corps of Engineers would be responsible for the Federal share of any mutually agreed upon rehabilitation of the project that exceeds the annual operation and maintenance requirements identified in the final Definite Project Report and that is needed as a result of specific storm or flood events. Rehabilitation of the project is considered to be reconstructive work that cannot be accurately estimated at this time.

In accordance with the 1986 WRDA, a 25-percent non-Federal cost share will be required for general design and construction costs assessable to those project features or portions thereof located on lands not "managed as a national wildlife refuge". All features identified for the Rice Lake HREP will require cost sharing. A Project Cooperation Agreement (PCA) will be executed consistent with this requirement.

The District Engineer has reviewed the project outputs and determined that the implementation of the selected plan is justified and in the Federal interest. Therefore, construction approval for the Rice Lake HREP is recommended by the Rock Island District Engineer at an estimated Federal expense of $4,836,035 (Phase I - $1,285,055, Phase II - $3,550,980). The total Federal cost, including general design, is $5,161,535. The total non-Federal cost share is estimated at $536,852 for completing Phase I work or $1,456,900 if both Phases I and II are completed under the initial project. The purchase of Duck Island would satisfy the cost sharing requirements for both construction phases.

UMRS EMP

RICE LAKE ENHANCEMENT PROJECT

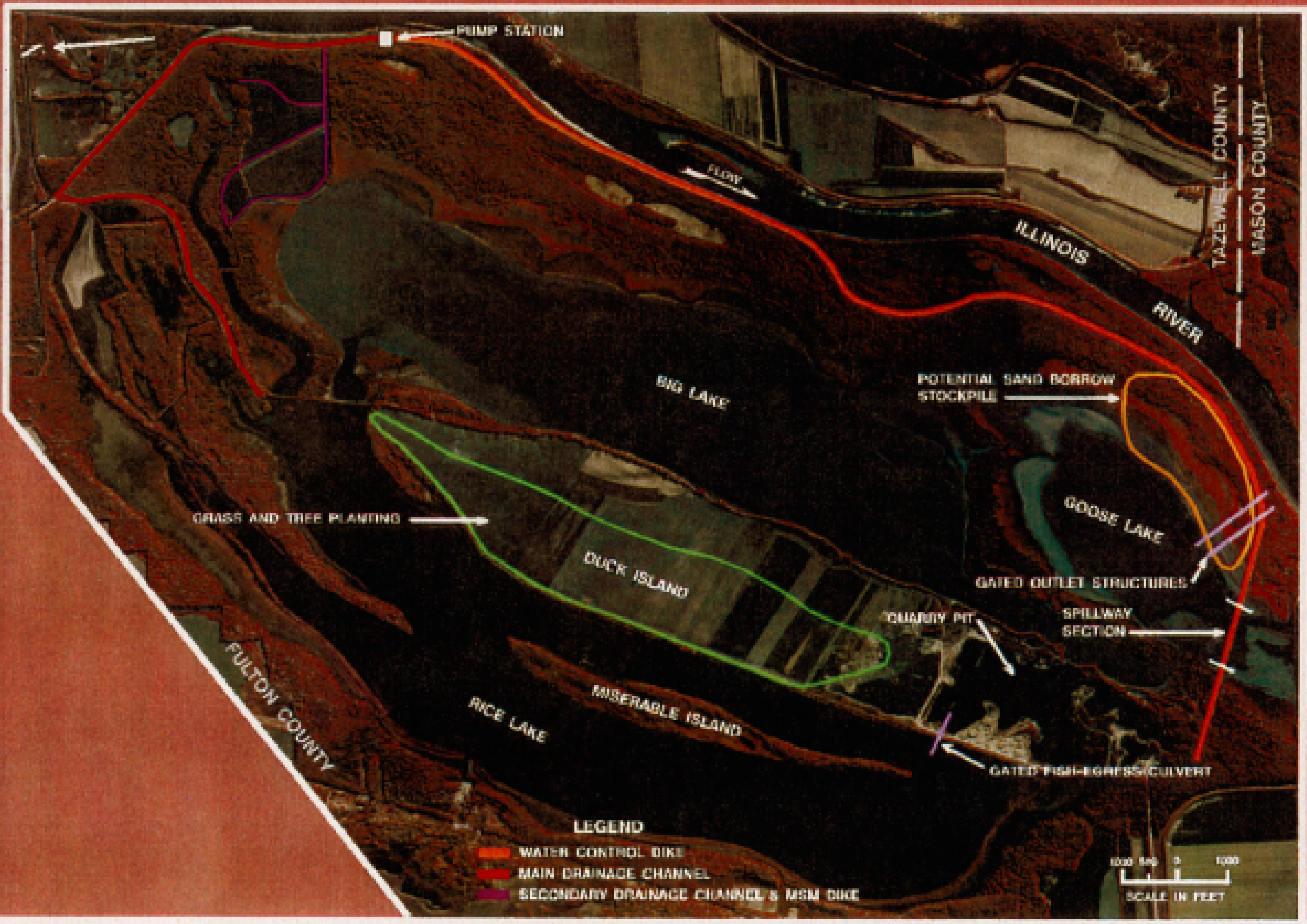

FIGURE ES-1

UPPER MISSISSIPPI RIVER SYSTEM
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LA GRANGE POOL, ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

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FULTON COUNTY, ILLINOIS

1. INTRODUCTION

a. Purpose. The purpose of this report is to present a detailed proposal for the rehabilitation and enhancement of Rice Lake State Fish and Wildlife Area (SFWA). This report provides planning, engineering, and sufficient construction details of the selected plan to allow final design and construction to proceed subsequent to approval of this document.

b. Resource Problems and Opportunities. The project area has historically acted as excellent aquatic and mid-migration waterfowl habitat. While levees and water control structures installed by the State have enabled water level manipulation with sporadic success, continuing accumulation of silt and rapid river level fluctuations have diminished their effectiveness in assuring annual food production for the 2.7 million annual waterfowl use days.

The opportunity exists in the study area to enhance overall wetland and terrestrial habitat value by building low level water control dikes to attenuate summer and fall flooding and providing food sources on Rice Lake SFWA.

c. Scope of Study. Rice Lake SFWA is a wildlife management area located on the right descending bank of the Illinois River approximately 4 miles downstream of Banner, Illinois, between River Miles (RM) 132.0 and 138.0. It is located in Fulton County, Illinois, approximately 24 miles southwest of Peoria, Illinois. Plate 1 provides vicinity and general location maps for Rice Lake SFWA. Plate 2 shows a site-specific plan.

The scope of this study focuses on proposed project features that would improve aquatic and wetland habitat and enhance overall resource values. The project is consistent with agency management goals and was planned for the benefit of resident and migratory birds and fish and other wildlife.

Field surveys and habitat quantification procedures were completed to support the planning and assessment of proposed project alternatives. Soil borings were taken to determine sediment types and excavation difficulty. Baseline water quality monitoring was performed to define present water quality conditions/problems.

Wildlife and resident fish observations within the study area have been made by the Illinois Department of Natural Resources (DNR). These observations, along with future studies and monitoring, will assist in evaluating project performance.

d. Format of Report. The report is organized to follow a general problem-solving format. The purpose and problems are presented in Section 1. Section 2 provides an overview of how and why Rice Lake SFWA was selected as a project within the Environmental Management Program. Section 3 establishes the baseline for existing resources. Section 4 provides the objectives of the project. Sections 5, 6, 7 and 8 propose and evaluate project alternatives, and Section 9 describes the selected plan in accordance with the National Environmental Policy Act. Section 10 provides general design and construction considerations. Section 11 assesses the environmental effects from the proposed plan. Section 12 summarizes project accomplishments and outputs. Sections 13, 14, and 15 describe estimated operation and maintenance considerations, performance monitoring, and detailed cost estimates for both initial construction and annual operation and maintenance. Sections 16, 17, 18, and 19 provide summary of implementation requirements and coordination. Sections 20 and 21 present the conclusions and recommendations. A Finding of No Significant Impact follows the main report.

Drawings (plates) have been furnished to provide sufficient detail to allow review of the existing features and the proposed plan. Plate 1 shows the project location and La Grange Pool environs. Plate 2 shows the existing conditions site plan and the recommended plan. Plate 3 shows the alternative plans evaluated. Plates 4, 5, and 6 provide soil boring locations and logs that were used to evaluate foundation effects and excavation/fill methods. Typical sections are presented on plate 7. Pump station layout and sections are shown on plates 8 through 13. Pump station electrical plans and details are shown on plates 14 and 15. The project monitoring plan is shown on plate 16.

e. Authority. The authority for this report is provided by the 1985 Supplemental Appropriations Act (Public Law 99-88) and Section 1103 of the Water Resources Development Act of 1986 (Public Law 99-662). The proposed project would be funded and constructed under this authorization. Section 1103 is summarized as follows:

Section 1103. UPPER MISSISSIPPI RIVER PLAN

(a)(1) This section may be cited as the Upper Mississippi River Management Act of 1986.

(2) To ensure the coordinated development and enhancement of the Upper Mississippi River System (UMR), it is hereby declared to be the intent of Congress to recognize that system as a nationally significant ecosystem and a nationally significant commercial navigation system. Congress further recognizes that this system provides a

diversity of opportunities and experiences.

The system shall be administered and regulated in recognition of its several purposes.

(e)(1) The Secretary, in consultation with the Secretary of the Interior and the States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin, is authorized to undertake, as identified in the Master Plan -

(A) a program for the planning, construction, and evaluation of measures for fish and wildlife habitat rehabilitation and enhancement;

(B) implementation of a long-term resource monitoring program;

(C) implementation of a computerized inventory and analysis system;

(f)(1) implementation of a program of recreational projects;

(2) assessment of the economic benefits generated by recreational activities in the system; and

(h)(1) monitoring of traffic movements on the system.

2. GENERAL PROJECT PROCESSING

a. Eligibility Criteria. A design memorandum did not exist at the time of the enactment of Section 1103. Therefore, the Rock Island District, U.S. Army Corps of Engineers, completed a "General Plan" for the implementation of the Upper Mississippi River System - Environmental Management Program (UMRS-EMP) in January 1986. The U.S. Fish and Wildlife Service (USFWS), Region 3, and the five affected states (Illinois, Iowa, Minnesota, Missouri, and Wisconsin) participated through the Upper Mississippi River Basin Association. Programmatic updates of the General Plan for budget planning and policy development have been accomplished through Annual Addenda.

Coordination with the States and the USFWS during the preparation of the General Plan and Annual Addenda led to an examination of the Comprehensive Master Plan for the Management of the Upper Mississippi River System. The Master Plan, completed by the Upper Mississippi River Basin Commission in 1981, was the basis of the recommendations enacted into law in Section 1103. The Master Plan and General Plan identify examples of potential habitat rehabilitation and enhancement techniques. Consideration of the Federal interest and Federal policies has resulted in the following conclusions:

(1) First Annual Addendum. The Master Plan report and the authorizing legislation do not pose explicit constraints on the kinds of projects to be implemented under the UMRS-EMP. For habitat projects, the main eligibility criteria should be that a direct relationship should exist between the project and the central problem as defined by the Master Plan, i.e., the sedimentation of backwaters and side channels of the UMRS. Other criteria include geographic proximity to the river (for erosion control), other agency missions, and whether the condition is the result of deferred maintenance.

(2) Second Annual Addendum. The types of projects that are definitely within the realm of Corps of Engineers implementation authorities include the following:

- backwater dredging
- dike and levee construction
- island construction
- bank stabilization
- side channel openings/closures
- wing and closing dam modifications
- aeration and water control systems
- waterfowl nesting cover (as a complement to one of the other project types)
- acquisition of wildlife lands (for wetland restoration and protection)

(3) Subsequent Annual Addenda. Subsequent annual addenda, of which the Sixth Annual Addendum (dated May 1991) is the most recent, provide a vehicle for reporting program progress, communicating policy guidance, and ensuring thorough coordination among the participating State and Federal agencies.

b. General Selection Process. The following steps provide an overview of the process of project selection. The steps are interactive with communication in both directions and occur through a continual process.

(1) State/USFWS Project Nomination. Projects are nominated for inclusion in the Rock Island District's habitat program by the respective State conservation agencies and the USFWS based on agency management objectives. Rock Island District assists the States and USFWS agencies in proposing habitat projects through an in-house task force that includes staff members from the Planning, Engineering, Operations, and Construction Divisions. As projects are being conceptualized, this group meets on site with State and USFWS personnel to examine as fully as possible what site-specific enhancements would be both environmentally desirable and engineeringly feasible.

(2) Fish and Wildlife Interagency Committee (FWIC) Ratings. To assist in the project formulation process, the FWIC, a group composed of State and Federal biologists who are assigned to aquatic and terrestrial projects (refuges, wildlife areas) along the Mississippi and Illinois Rivers, has convened a series of meetings starting in 1986 to consider critical habitat needs along the Mississippi and Illinois Rivers. At these meetings, the available habitat is evaluated on a pool-by-pool basis. These analyses reveal deficiencies (such as feeding, resting, and loafing areas for migratory waterfowl, absence of deep water off the main channel for diving ducks and fish) as well as types of habitat in abundant supply (e.g. mature bottomland hardwood.) (With this information, projects being considered can most accurately reflect broader regional needs in addition to representing the best site-specific choices.)

Projects then are ranked by the FWIC according to the biological benefits that they could provide. Each project is considered and evaluated relative to increasing habitat benefits for fish, waterfowl, and other wildlife. Every project is ranked according to the outputs provided as high, medium, or low. Figure 2-1 provides a comprehensive summary of the FWIC rankings for all current and future Rock Island District habitat projects.

(3) River Resources Coordinating Team (RRCT) Rankings. The FWIC rankings also are forwarded to the RRCT, an interagency policy group that meets to coordinate Mississippi and Illinois River activities. The RRCT examines the FWIC rankings and includes consideration of the broader policy perspectives of the agencies submitting the projects. The RRCT makes a recommended ranking.

(4) U.S. Army Corps of Engineers District Ranking. The District evaluates the FWIC and RRCT recommended rankings. The District then formulates a recommended program consistent with the EMP program guidance and District requirements.

(5) U.S. Army Corps of Engineers, Rock Island District Prioritizing. The District then submits a recommended program to their Division office. Additional coordination by the Division through the Environmental Management Program Coordinating Committee (EMP-CC) is effected. The Division office then submits

project fact sheets for approval to the Chief of Engineers and Assistant Secretary of the Army for Civil Works. Fact sheets and schedules are subsequently published, thereby completing the project selection process.

c. Specific Site Selection. After considering resource needs and deficiencies pool by pool, the Rice Lake SFWA was recommended and supported by the above selection process as providing significant aquatic and wetland benefits with opportunities for habitat enhancement. Enhanced capability to manage the project area for migratory bird, fish, and wildlife use will only be achieved by implementing the proposed project enhancements features.

Recognition of changes occurring in habitat composition and subsequent declines in migratory bird, wildlife, and fisheries habitat quality and availability along the Illinois River prompted the proposal of several projects by Federal and State agencies responsible for natural resource management in the La Grange Pool area. The Banner Marsh, Illinois, HREP, located upstream at RM 138.5 - 143.9, is currently in the final design phase. The Lake Chautauqua, Illinois, HREP, located downstream at RM 124.0 - 128.0, is currently under construction.

The following points were major considerations, along with the FWIC ranking, in selecting this project for the HREP program:

1. The Rice Lake SFWA is a high priority of the Illinois DNR.

2. The Rice Lake SFWA has historically provided good migratory waterfowl and shorebird habitat.

3. The opportunity exists to capitalize on present habitat interspersion—a mixture of aquatic, agricultural, and forest areas.

FWIC Rankings for CENCR HREPs

(HREPRANK.XLS, PDW3;serv6h)

Projects completed/underway			FWIC Priority List 3/		Projects ranked; not prioritized		
Project Name	**Points**	**Rank**	**Project Name**	**Points**	**Project Name**	**Points**	**Rank**
Monkey Chute, MO		(not ranked)	1. Gregory Landing, MO 2/	22	Elk River, IA	23	Medium
Andalusia Refuge, I L		(not ranked)	2. Pool 12 Overwintering, IL 2/	26	Turkey River Bottoms, IA	20	Low
Brown's Lake, IA		(not ranked)	3. Sanganois, IL 2/	26	Chautauqua Lake, IL (Phase II)	24	High
Bertom/McCartney, WI		(not ranked)	4. Blackhawk Bottoms, IA 2/	27	Mud Lake, IA	22	Medium
Big Timber, IA		(not ranked)	5. Huron Island, IA 2/	26/27	Quincy Bay, IL	20	Low
Potters Marsh, IL	27	High	6. Eagle Fill, IL 2/	18	Turkey/Otter Islands, IA	20/21	Low
Peoria Lake, IL	25	High	Smith's Creek, IA 2/	24	Sny Side Channel, IL	21	Low
Bay Island, MO	23	Medium			Bunker Chute, IA	20	Low
Chautauqua Lake, IL	24	High			Middle Sabula, IA	19	Low
Spring Lake, IL 1/	24/27	High			Pin Island, IA	20	Low
Lake Odessa, IA	23	Medium			Keithsburg Refuge, IL	22	Low
Cottonwood Island, MO	26	High			Miller's Lake, IL	26	High
Gardner Division, IL	25	High			Credit Island, IA	25	High
Banner Marsh, IL	29	High			Beaver Island, IA	26	High
Rice Lake, IL	27	High			Emiquon, IL	27	High
Princeton Refuge, IA	27	High					
Pool 11 Islands, WI	25	High					
Peosta Channel, IA	27	High					
Pleasant Creek, IA	26	High					
Molo Slough, IA	27	High					
Ranked projects completed via other programs							
Green Island, IA	23	Medium					

1/ Ranked as two phases subsequently rescoped to a single project.
2/ Baseline monitoring underway.
3/ Within list order reflects priority as agreed to at the 4 May 1995 FWIC meeting.

FIGURE 2-1
FWIC Rankings

3. ASSESSMENT OF EXISTING RESOURCES

a. Resource History and Description of Existing Features. The Illinois River Valley has historically been recognized as a significant resting and foraging area for migratory birds during spring and fall migration. For approximately the last 10,000 years, the Illinois River has continued to host the traditional fall passage of waterfowl seeking foods naturally present in the lakes, marshes and forests of the river's floodplain. The shallow floodplain lakes were normally between 4-6 feet deep and clear enough to allow sunlight penetration to bottom, resulting in abundant production of aquatic and emergent vegetation utilized by fish, waterfowl and other species. The broad floodplain also supported extensive bottomland forests with an abundance of pin oaks and pecan hickories used as a food source by waterfowl and other wildlife. For these reasons, the Illinois River was once one of the most productive riverine systems for fish and wildlife in North America.

Human activities in the Illinois River Valley over the last century have greatly reduced the abundant fish and wildlife resources of the past. Adverse changes include diversion of Lake Michigan water, excessive sewage and industrial waste, a greatly modified hydrology and landscape due to drainage and levee districts, impoundment by navigation dams, and sedimentation (USFWS, 1990). The frequency and duration of flooding in the project area has increased as upstream development has intensified the rate of runoff. Increased sedimentation associated with flood rates within the Illinois River Valley has resulted in the degradation of many mid-migration habitats used historically by waterfowl. High turbidity limits light penetration that is essential for photosynthesis by submerged hydrophytes. Similarly, emergent communities that once thrived in the backwater lakes no longer exist or are now extremely scarce because of sedimentation (CMT, 1991). While it is recognized that the river can never be as pristine as it once was, many actions are reversible and could result in restoration of a functional system in a number of areas along the river (USFWS, 1990).

Illinois is located in the heart of the Mississippi Flyway that supports an average 36 percent of all ducks in the contiguous United States. Twenty-two species of waterfowl migrate through Illinois each fall and spring. Historically, the Illinois River Valley has been one of the most important migration areas for mallards in the United States. Migration during fall and spring is an energy-demanding activity. Migrants need access to nutritious foods and rest at stopover areas to replenish reserves and satisfy the energetic costs of migration. As a result, waterfowl rely on diverse habitats at mid-migration latitudes to satisfy nutritional needs of various events during their annual cycle. Consequently, wetland programs for waterfowl in Illinois generally are directed at providing mid-migration habitat (Havera, 1996).

Bellrose, *et al.* (1979) reported that in the late 1930s some duck clubs in the Illinois River Valley began to use moist-soil management as a way to attract ducks to their property. Frederickson and Taylor (1982) defined moist-soil management as the manipulation of soil and water to produce food and cover in areas that experience seasonal flooding. By controlling the frequency, timing, length and depth of water level manipulations, necessary habitat resources can be produced at times coincident with migration and other events in the annual life cycle of waterfowl. Moist-soil management continues to be one of the most effective management techniques for improving migratory waterfowl habitat on public and private lands. The primary objective of moist soil management is to mimic the natural (historic) water regime by lowering water levels during summer to expose mudflats through drawdown for germination of moist-soil vegetation.

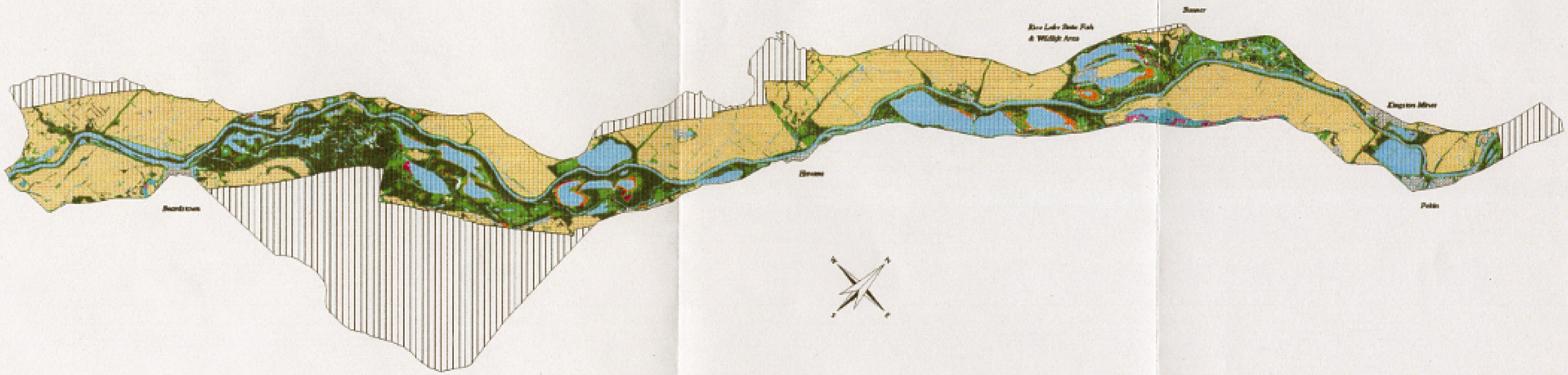
The Rice Lake SFWA is a series of natural backwater lakes and sloughs located on the westerly side of the Illinois River in the La Grange Pool between approximate RM 132.0 and 138.0. The project area is located on the east side of U.S. Route 24 in Fulton County, Illinois, approximately 24 miles southwest of Peoria. The Rice Lake project area is located adjacent to and immediately downstream of the Banner Marsh State Fish and Wildlife Area, the location of another HREP project that has been planned and approved for construction.

The project area is haven to a myriad of wildlife, including thousands of migrating waterfowl, herons, and shorebirds. Strategically located within the Illinois River Valley flight corridor of the Mississippi Flyway, this area and other sites in the immediate region are famous as traditional resting areas for waterfowl and shorebirds on both their spring and fall migrations to and from their breeding grounds in Canada and their wintering grounds in the Mississippi delta, along coastal marshes, and Central and South America.

b. Land Use and Current Management Objectives. Figures 3-1 and 3-2 show the dominant vegetation types in the Rice Lake SFWA area. The Rice Lake SFWA encompasses approximately 5,600 acres of the Illinois River floodplain. This area began with an initial purchase of 2,370 acres of land in 1945, through Federal assistance under the Pittman-Robertson Act. The area was designated as a refuge for migratory waterfowl with a portion open to hunting. Additional parcels of land acquired during the 1950s through the 1980s increased the total acreage to approximately 2,700 acres, and the most recent purchase in 1986 of two major waterfowl clubs comprising over 2,900 acres brought the Rice Lake SFWA to its current size.

The land and water areas that comprise the Rice Lake SFWA are situated in a roughly horseshoe-shaped configuration. Rice Lake, Big Lake, and Goose Lake are the principle water bodies. The project area also includes several smaller wetland areas operated as separate management units (Ridge Field, Barton Field, Walk-in Area, Copperas Creek or Voorhees Unit, Pond Lily Lake, Slim Lake, and Lock Pond). These wetland and shallow aquatic areas total approximately 3,450 acres. Most of the remaining project area acreage (approximately 2,000 acres) is covered by bottomland hardwood forest typical of the Illinois River Valley. A large private inholding, the Duck Island peninsula, is almost completely surrounded by the Illinois DNR-owned project lands. This approximately 1,200-acre inholding is a natural floodplain ridge that acts as a barrier between Rice Lake to the west and Big and Goose Lakes to the east.

1991 Land Cover/Land Use
La Grange Pool, Illinois Waterway



- Agriculture
- Emergents
- Emergent-Grasses/Forbs
- Grasses/Forbs
- Open Water
- Rooted Floating Aquatics
- Rooted Floating Aquatics - Emergents
- Sand/Mud
- Submergents
- Urban/Developed
- Woody Terrestrial
- No Photo Coverage

Vegetation Category	Acres	Percent
Agriculture	65,303	45.2
Emergents	417	0.3
Emergents - Grasses/Forbs	10	---
Grasses/Forbs	15,341	10.6
Open Water	24,490	16.9
Rooted Floating Aquatics	273	0.2
Rooted Floating Aquatics - Emergents	9	---
Sand/Mud	2,135	1.5
Submergents	1,390	1.0
Submergents-Rooted Floating Aquatics	241	0.2
Urban/Developed	3,431	2.4
Woody Terrestrial	31,455	21.7
Total Area	144,495	100.0

Location

2 0 2 4 6 8 Statute Miles

5 0 5 10 15 Kilometres

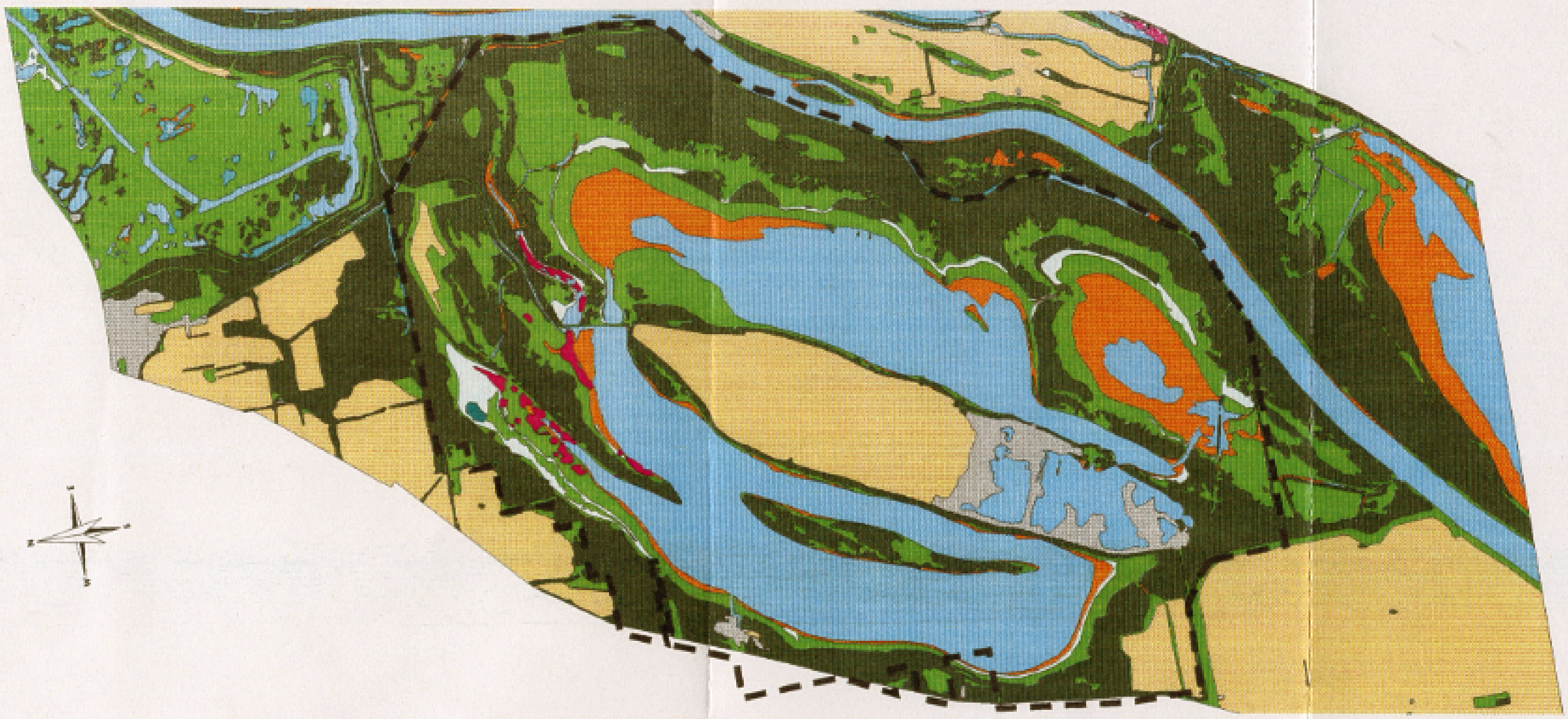
Universal Transverse Mercator Projection, Zone 15, NAD 27

Data from the Environmental Management Technical Center (EMTC), NBS, Onalaska, WI
Cartographer: Kevin Anderson

US Army Corps of Engineers
Rock Island District

FIGURE 3-1

1991 Land Cover/Land Use, La Grange Pool
Rice Lake State Fish & Wildlife Area



Agriculture

Emergents

Emergent-Grasses/Forbs

Grasses/Forbs

Open Water

Rooted Floating Aquatics

Sand/Mud

Submergents

Urban/Developed

Woody Terrestrial

Project Boundary

Vegetation Category	Acres	Percent
Agriculture	639	9
Emergents	148	2
Emergents - Grasses/Forbs	4	--
Grasses/Forbs	1,376	20
Open Water	1,945	28
Rooted Floating Aquatics	46	1
Sand/Mud	470	7
Submergents	2	--
Urban/Developed	168	3
Woody Terrestrial	2,049	30
Total Project Area	6,847	100

Location

2000 0 2000 4000 6000 Feet

500 0 500 1000 1500 2000 Metres

Data from the Environmental Management Technical Center (EMTC), NBS, Onalaska, WI
Cartographer: Kevin Anderson

Universal Transverse Mercator Projection, Zone 15, NAD 27

US Army Corps of Engineers
Rock Island District

FIGURE 3-2

The primary uses of the Rice Lake SFWA to date have been wildlife observation, waterfowl hunting, sport fishing, camping and commercial fishing. Constructed facilities for public use include a camping area, a boat channel with floating docks and concrete launching ramp, parking areas, a public access road, administrative and maintenance buildings, and service roads. Most of these facilities are located on the west side of the project area adjacent to U.S. Highway 24. Existing water control structures and other facilities currently operated for habitat management purposes include the Narrows Dam, a pump station used to move water from the Illinois River into Rice Lake, and a number of low water control dikes, gated outlets, and drainage ditches associated with the smaller management units. The remnants of a water control dike (the Hate Levee) are located at the southern end of Goose Lake. This structure was largely eradicated by repeated flooding and has been nonfunctional since the property it occupies was acquired by the Illinois DNR.

Wetland habitat within the Illinois River valley has been steadily deteriorating throughout this century. The primary long-range goal at the Rice Lake SFWA is to moderate this trend within the confines of the project area through implementation of a management, development and acquisition program that will provide quality habitat, attractive to many species of wildlife, while at the same time providing the public with increased hunting, fishing, and other recreational opportunities (IDOC, 1989).

The objectives of the Rice Lake SFWA as stated in the Illinois DNR's Natural Resource Management Plan (1989) are as follows:

Primary Objective - The primary objective of Rice Lake SFWA is to conserve and enhance, where appropriate, essential quality nesting and mid-migration habitat, including refuge, for both migratory and resident waterfowl populations utilizing the Illinois River Valley flight corridor of the Mississippi Flyway.

Secondary Objectives - The following secondary objectives have been developed to provide guidelines for acquisition, development and management, including public usage, of the site.

1. To conserve natural bottomland habitat of migratory and resident, game and non-game fauna inhabiting the site, including rare, threatened and endangered species.

2. To conserve natural bottomland habitat of native flora inhabiting the site, including rare, threatened, and endangered species.

3. Provide an opportunity for quality public waterfowl hunting to the extent that the primary objective is not jeopardized.

4. Provide an opportunity for other compatible public recreational usage, including sport and commercial fishing, furbearer trapping, vehicular camping, pleasure boating, hiking, wildlife observation, and sightseeing to the extent feasible.

The emphasis on wetland and waterfowl management at the Rice Lake SFWA reflects not only the immediate goals of local resource managers, but also those of the Fish and Wildlife Interagency Committee (FWIC) for habitat enhancement in Pools 11-22 of the Upper Mississippi and Illinois Waterway, Partners in Flight, and the North American Waterfowl Management Plan (NAWMP). The NAWMP aims to increase waterfowl populations and their habitats, particularly those that are at critically low levels. It has been estimated that 20 percent of all ducks in North America utilize the Upper Mississippi River System for feeding and resting during migration (Upper Mississippi River Basin Commission, 1981). This statistic points to the need for optimum management of refuge areas such as the Big Lake portion of the Rice Lake State Fish and Wildlife Management Area. In fact, a recent study indicates that refuge areas may be necessary to prevent disturbance of waterfowl during spring and fall migrations (Havera *et al.,* 1992), particularly in areas where waterfowl numbers have declined.

Seasonal flooding and dewatering of the lake areas and management units of the Rice Lake SFWA is essential to meet the stated objectives of the project. Successful operation is dependent on the ability to control water levels in the project area. The water level management plan at Rice Lake, when Illinois River elevations allow, is to hold the lake at a spring pool elevation of 437 NGVD, creating an approximately 1,400 surface-acre lake with an average depth of 2.4 feet and a shoreline at the timber's edge. During the third week of June, Rice Lake is drawn down over a 21-day period to elevation 435, exposing approximately 500 acres of mudflats. This exposure facilitates firming of the highly flocculent lake bottom material that, in turn, encourages production of native moist-soil vegetation and also allows aerial seeding of Japanese millet where appropriate to meet management objectives. Both the native moist-soil plants and the non-native species provide a high quality food base for resident and migratory wildlife. In mid-September (or earlier during drought conditions), the lake is recharged by pumping to return to elevation 437 by the beginning of November

Existing facilities at the Rice Lake SFWA provide only limited water level control capability on Rice Lake and some of the smaller moist soil management units. The success of water level control efforts on Rice Lake is dependent on whether water levels on the Illinois River remain below elevation 439 NGVD (the spillway crest elevation of the Narrows Dam) during the critical drawdown period. Because no facilities for water level management currently exist on Big Lake and its associated management units, water levels in these portions of the project area are entirely controlled by the stage of the Illinois River. The proposed management plan for Big Lake would be to hold the lake at a spring pool elevation of 436, with drawdown over a 21-day period to elevation 434 beginning June 15. Under current conditions, the management plan cannot be reliably implemented due to midsummer fluctuations in Illinois River water levels and the inability to control water levels in the lake independent of river stage.

c. Wetland and Waterfowl Resources. The topography of the Rice Lake SFWA is primarily a low, relatively flat floodplain landscape that is characterized by a mosaic of backwater lakes, sloughs, bottomland hardwood forest, mud flats, and diked fields managed for moist-soil vegetation and planted wildlife food crops. Examination of National Wetland Inventory (NWI) maps of the project area indicate that most of the present acreage of the Rice Lake SFWA is classified as palustrine or lacustrine wetland.

A large variety of birds utilize the project area during some part of their annual life cycles. At least 164 species of birds have been reported for the Rice Lake SFWA (CMT, 1991). Waterfowl species are perhaps the most easily recognized due to their high visibility as well as their recreational and economic value. A mean annual total of 2,517,100 duck use-days was recorded for the project area during the period 1975-1987, as reported in annual aerial inventories conducted by the Illinois Natural History Survey (INHS). The project area also provides extremely important foraging habitat for wading birds such as herons and egrets, and shorebirds such as sandpipers and yellowlegs. In response to recommendations that the Rice Lake SFWA participate in the Western Hemisphere Shorebird Reserve Network, the Illinois DNR has recommended that the project area be managed to complement shorebird use, within the context of the primary site objective.

d. Terrestrial Resources. Bottomland hardwood forest represents the largest single land cover type in the Rice Lake SFWA (approximately 2,000 acres of the project area). Dominant species include silver maple, cottonwood, green ash, and American elm. A majority of the forested area is composed of pole size to sawlog size material with limited reproduction. Willows and silver maples have invaded the shallow areas of Big Lake and Goose Lake due to the inability to control water levels in these areas. A small percentage of other native species such as pin oak, basswood, river birch, box elder, mulberry, and pecan are also reported as occurring on elevated ridges and terraces in the project area. Discussions with the Illinois DNR site manager indicated that the existing pin oak population was extensively damaged if not eradicated by severe flooding during 1993 and 1995. Lack of forest regeneration and tree mortality can be directly attributed to the increase in flood frequency and duration over time.

The project area also provides habitat for a number of mammal species. Game and furbearing mammals significant to the study area include fox squirrel, rabbit, woodchuck, white-tailed deer, muskrat, raccoon, opossum, skunk, mink, red fox, coyote, and beaver. Small mammal species collected during a 1987 survey of the project area included short-tailed shrew, least shrew, thirteen-lined ground squirrel, western harvest mouse, deer mouse, white-footed mouse, meadow vole, prairie vole, house mouse, little brown bat, Keen's bat, big brown bat, and red bat.

The Duck Island peninsula is a large private inholding that encompasses approximately 1,200 acres of land. Approximately 600 acres of this property is leased for agricultural use and is planted in row crops (corn and soybeans) during the growing season. A tenant mining operation encompassing some 300+ acres is located on the southern end of the peninsula. Aggregate material is extracted from this facility. A portion of the property is also leased for hunting.

e. Aquatic Resources. The principal water bodies within the project area are Rice Lake, Big Lake, Goose Lake, Slim Lake, Beebe Lake, and the Duck Island Gravel Pit. These backwater lakes are sustained primarily by groundwater seepage and overflow from the Illinois River. Historically, the frequency and duration of flooding has increased over time as upstream development has intensified the rate of runoff. According to a 1979 study conducted by the INHS, increased siltation is reducing water depths in both Big Lake and Rice Lake. Although the INHS reports that Rice Lake has the lowest siltation rate of any of the remaining Illinois River backwater lakes, siltation is still occurring.

Because the Rice Lake SFWA is not separated from the Illinois River by a high levee, its fish populations fluctuate in composition, numbers, and condition as the area is alternately flooded and dewatered by river levels. The basin of Rice Lake is broad and dish-shaped, not providing a significant amount of desirable fish cover. Water level management activities involve midsummer drawdowns to promote moist-soil plant production. As a result, water levels in Rice Lake during July and August are typically no more than 12-16 inches, with water temperatures during drawdown approaching 90 degrees Fahrenheit. These conditions severely limit both the composition and survival of fish populations.

Fish species found in the project area are those common to the La Grange Pool of the Illinois River. Thirty-six fish species have been collected from the waters of the Rice Lake SFWA during recent years. Random sampling of Rice Lake conducted during 1991 and 1992 as part of the EMP's Long-Term Resource Monitoring Program (LTRMP) collected 15 species. LTRMP sampling of Big Lake, Goose Lake, Beebe Lake, and the Duck Island gravel pit during 1994 and 1995 yielded 35 species and 1 hybrid. The Illinois DNR's district fisheries biologist reported that several paddlefish were documented as occurring in this area during 1995, and that three radio-tagged largemouth bass were documented as traveling between Havana and the Duck Island gravel pit.

f. Water Quality. Baseline water quality monitoring studies conducted at the Rice Lake SFWA from May 1987 through February 1994 have shown that, on occasion, pH values exceed 9.0 and dissolved oxygen concentrations fall below 5 mg/l. Periodic extreme plant photosynthesis/respiration would appear to be the primary factors contributing to these events. The shallow nature of the lakes coupled with the aquatic vegetation present most likely result in wide swings in pH values and dissolved oxygen concentrations during a typical summer day. A combination of resuspended bed material and algal biomass appears to be causing the lakes' relatively high, suspended solids concentration. A more detailed analysis of baseline water quality monitoring results can be found in Appendix F.

g. Endangered Species. The following is a list of federally endangered species known to occur in Fulton County:

Status	Common Name	Scientific Name
T	Bald eagle	*Haliaeetus leucocephalus*
T	Decurrent false aster	*Boltonia decurrens*

The bald eagle occurs in the vicinity of Rice Lake during winter months. A portion of the Rice Lake SFWA has been designated as a significant winter roost site, and the present management plan provides for a refuge area for the species.

Decurrent false aster prefers disturbed, open sites of the Illinois River Valley. This species is under management at the Rice Lake SFWA and is present in two portions of the project area.

The Natural Resource Management Plan (1989) developed for the Banner Marsh/Rice Lake complex reported that 19 State listed endangered or threatened species (in addition to the bald eagle) had been recorded on the complex. These species are: double-crested cormorant (*Phalacrocorax auritus*), great egret (*Casmerodius albus*), little blue heron (*Florida caerulea*), American bittern (*Botaurus lentiginosus*), black-crowned night heron (*Nycticorax nycticorax*), Mississippi kite (*Ictinia mississippiensis*), Cooper's hawk (*Accipiter cooperii*), red-shouldered hawk (*Buteo lineatus*), osprey (*Pandion haliaeetus*), peregrine falcon (*Falco peregrinus*), black rail (*Laterallus jamaicensis*), piping plover (*Charadrius melodus*), Wilson's phalarope (*Steganopus tricolor*), black tern (*Chilidonias niger*), brown creeper (*Certhia familiarus*), veery (*Hylocichla fuscescens*), pied-billed grebe (*Podilymbus podiceps*), least bittern (*Ixobrychus exilis*), and river otter (*Lutra canadensis*).

h. Historic Properties. The Rock Island District coordinated the project features with the Illinois DNR and the Illinois Historic Preservation Agency (IHPA) requesting comments concerning the possible effects of the project on historic properties. Correspondence with the IHPA dated July 20, 1995 (Appendix A, IHPA LOG #950706004P-F), deferred comment to the Illinois DNR.

The Illinois DNR provided copies of cultural resource management reports documenting historic properties. Ms. Marjorie B. Schroeder, Illinois State Museum, Quaternary Studies Program, Springfield, Illinois, under contract with the Illinois DNR produced the following reports within the Rice Lake State Fish and Wildlife Area: *Cultural Resources Studies at Illinois Department of Conservation State Parks and Recreation Areas, Volume Five: The 1989 Season* (Technical Report 90-532-5), *Cultural Resources Studies at Illinois Department of Conservation State Parks and Recreation Areas, Volume Six: The 1990 Season* (Technical Report 90-594-2), and *Cultural Resources Studies at Illinois Department of Conservation State Parks and Recreation Areas, Volume Seven: The 1991-1992 Seasons* (Technical Report 93-782-11). These reports document numerous archeological historic properties. These previously documented historic properties were avoided during the design of this Habitat Rehabilitation and Enhancement Project.

In July 1993, the IHPA and the Corps of Engineers determined that portions of the Illinois Waterway Navigation Channel, from RM 80.2 to 327.0, were determined eligible for listing on the National Register of Historic Places. The Corps of Engineers and the IHPA have undertaken to determine significant elements and structures within the system.

As a result of the previous study, it is the preliminary opinion of the Corps that the Copperas Creek lock is eligible for the National Register of Historic Places, as documented in the draft report: *Architectural and Engineering Resources of the Illinois Waterway between 130th Street in Chicago and La Grange, Volumes I and II,* prepared by Rathbun Associates, Hollandale, Wisconsin, as subcontracted to American Resources Group, Ltd., Carbondale, Illinois under Delivery Order No. 1123, Contract No. DACW25-93-D-1112, dated June 1996.

To meet Corps requirements pursuant to Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended, and its implementing regulations 36 CFR Part 800: "Protection of Historic Properties," the Corps contracted with Illinois State Museum, Springfield, under Indefinite Quantities Contract No. DACW25-93-D-0014, work order No. 0017. The work order directed Illinois State Museum to conduct and report upon the Phase I intensive archeological survey and supporting geomorphological investigations within 177.87 hectares (441.5 acres) to search for, and identify, undocumented historic properties not covered by previous cultural resource studies conducted by Illinois State Museum.

i. Hazardous, Toxic, and Radioactive Waste. A hazardous, toxic, and radioactive waste (HTRW) compliance assessment was conducted. The project is located in an area that primarily is and historically has been agricultural, gravel pit and outdoor recreational land. There is little evidence that the land has been used for other purposes. There were no obvious indications of potential contamination sources or migration pathways from surrounding properties. It does not appear that there is a risk of hazardous, toxic, or radioactive waste contamination within the project area.

4. PROJECT OBJECTIVES

a. *Objectives and Potential Enhancement Features.* The project goals, objectives, and potential enhancement features are summarized in Table 4-1. In developing the potential enhancement features, consideration was given to satisfying project objectives while maximizing utilization of resource opportunities. A potential enhancement feature is intended to satisfy at least one objective, either singularly or in combination with other enhancement features.

Enhancement features are to be components of an overall alternative that will satisfy the project goals and objectives. The enhancement features are described and assessed in Sections 5 and 6.

TABLE 4-1

Project Goals, Objectives, and Potential Enhancement Features

Goal	Objective	Potential Enhancement Features
Enhance Wetland Habitat	Increase rate of success of emergent/moist soil vegetation Increase food and shelter for wetland wildlife	Reestablish Hate Levee with water control structure Water control dike added between Hate Levee and access road Construct pump station with conveyance ditches
Enhance Aquatic Habitat	Increase fish egress from Rice Lake during drawdown	Acquire Duck Island and provide gated structure
Enhance Terrestrial Habitat	Increase food and cover for terrestrial wildlife	Establish mast tree plantings and warm season grass plantings on Duck Island

b. Criteria for Potential Enhancement Features. Table 4-2 presents general and specific criteria developed to assess potential enhancements features.

TABLE 4-2

Potential Enhancement Features Development Criteria

Item	Purpose of Criteria
A. General Criteria	
Locate and construct features consistent with EMP directives	Comply with program authorities
Construct features consistent with Federal, State, and local laws	Comply with environmental laws
Develop features that can be monitored	Provide baseline for project effects (e.g., sedimentation, stability, water quality)
Design features to facilitate operation and maintenance	Minimize operation and maintenance costs
Locate and construct features consistent with best planning and engineering practice	Provide basis for project evaluation and alternative selection
B. Low Level Water Control Dike	
Provide reliable water control dike consistent with management goals	Provide water level control over the rapid rise and fall of water levels consistent with management goals
Provide gated culverts for maximum gravity water control	Increase success rate beyond simple detention/retention of river water
C. Pump Station	
Provide a reliable/low maintenance source of water	Increase success rate beyond simple gravity flow dependent on river stage
D. Grassland and Mast Tree Planting	
Locate plantings in existing crop areas	Increase bottomland hardwood and native grass diversity
Locate plantings on high ground	Maximize tree survival rate
E. Fish Egress During Rice Lake Drawdown	
Provide structure designed to facilitate fish egress from Rice Lake into gravel pit	Increase fish survival during drawdown periods and reduce avian botulism

5. POTENTIAL FEATURES OF ALTERNATIVES

The purpose of this section is to describe and assess a preliminary number of potential enhancement features. Once these features are evaluated in this section, Section 6 will formulate alternatives based on combinations of features.

Potential enhancement features were determined based on their ultimate contribution to the project goals and objectives, engineering considerations, and local restrictions or constraints. These development criteria are summarized in Table 4-2. Enhancement features that were not feasible or did not meet the criteria of Table 4-2 were not subject to further evaluation. Once the initial screening was completed, the remaining potential enhancement features were optimized to fully or partially satisfy the project objective(s). The optimized potential enhancement features were combined to make up alternatives that meet the project goals and objectives of Table 4-1.

a. Perimeter Water Control Dike. The Rice Lake Complex has historically served as valuable habitat for migratory waterfowl and local wildlife. Due to construction and maintenance of a 9-foot navigation channel on the Illinois River, this series of loosely connected backwater lakes has been transformed into a more or less contiguous lake. The dike will be constructed of dredged sand to an elevation of 442 with 5 to 1 side slopes and a 10-foot crown width. The dike will be designed with a riprap or gabion spillway structure at an elevation of 440 to allow the interior water level of the Goose Lake/Big Lake component of the complex to equalize with the river level before overtopping the deflection dike. To allow maximum flexibility and to keep the operation and maintenance cost of the project down there will be gated culverts installed at the southwest corner of Goose Lake (plate 2). There will be two 60-inch-diameter corrugated metal pipe culverts with headwall sluice gates.

b. Pump Station. A new pump station is proposed as shown on plate 2. The location of the pump station was chosen to allow accessible water conveyance with minimal maintenance dredging problems. Several thousand feet of ditches are required to convey the water to and from the lakes. These ditch sections will be constructed by a combination of mechanical excavation and embankment placement. Two alternatives were considered to optimize the pump station.

(1) The first alternative is to abandon the existing pump station. This pump station has a capacity of approximately 50,000 gpm and was designed to raise Rice Lake 2 feet within a 21-day period. The station consists of two pumps, each furnished by three-phase, overhead electric power. The inlet channel to the existing pump station is a 3,900-foot channel from the Illinois Waterway. This channel requires maintenance dredging approximately once every 3 years. Adjacent dredged material placement has become an increasing problem. A new pump station would be constructed near the old Copperas Creek lock. The new pump station would have the capacity to fill both Rice Lake and Big Lake. The use of two or three pumps in the pump station was considered. Plates 9 through 12 show the two configurations. Plate 13 shows the intake structure for the pump station.

Because of power efficiencies and resulting cost savings, the three-pump configuration was selected.

(2) In the second alternative, the existing pump station would remain to supply Rice Lake and a second pump station would be constructed above the old Copperas Creek lock to supply Big Lake. This alternative would allow the objective of having control over water levels on both lakes and would reduce the total excavation for conveyance, but would not reduce the problems associated with the sediment buildup in the channel from the river to the existing pump station.

c. Mast Tree Plantings. This feature consists of planting mast-producing trees at the locations shown on plate 2. Mast trees would be planted on approximately 100 acres of Duck Island that are currently cultivated for agricultural purposes. Because the area to be planted is currently in agricultural production it will be ideal for mast tree establishment because minimal site preparation would be required. The objective of the proposed tree planting would be to enhance the habitat value of the forest resource by introducing a component of mast-producing species into a forest dominated by silver maple and cottonwood. Species to be planted would include pin oak, swamp white oak, bur oak, pecan, and sycamore. Duck Island is the highest area in the Rice Lake Wildlife Area and best suited to support trees that are moderately tolerant of flooding.

d. Warm Season Grass Planting. The Rice Lake site is currently dominated by two habitat types—open water and woody terrestrial. Approximately 200 acres of the land currently being used for agricultural purposes will be used for planting a mixture of warm season grasses.

e. Fish Egress Structure. The Rice Lake site has experienced numerous outbreaks of avian botulism attributed to the reduction of water levels. It is believed that providing a route for fish to escape Rice Lake, thereby reducing the fish kills related to water reduction and decaying organic matter associated with the fish carcasses, will reduce the occurrence of avian botulism.

f. Gravel Pit Pump Station. The gravel pit, which is as deep as 30 feet, was considered as a potential source of water that would eliminate concerns with silting in of the inlet channel. This alternative would have required closing, by levee construction of the opening between Beebe Lake and the pit. After borings were completed in the vicinity of the opening, it was determined that the hydraulic connection between the lakes would be too great and pumping would be drawing water in along the southern shore of Duck Island. Therefore, this feature was not included in the incremental analysis.

g. Water Diversion from Duck Creek. Diversion of water from Duck Creek on the western end of Rice Lake was also considered as a potential source of water that would eliminate concerns with silting in of the inlet channel. This alternative was highly desirable from the standpoint of low capital cost for construction and maintenance cost. However, the major source of water for this alternative is a cooling reservoir for a nearby power plant. The plant would have to agree to release significant quantities of water annually for this alternative to work. Because of the uncertainty of the hydrologic cycles and the difficulty of obtaining binding agreements with private entities, this alternative was not considered further and is not included in the incremental analysis.

h. Senate Island Side Channel. The excavation of the side channel between Senate Island and the refuge was considered to provide material for construction of the deflection dike. This side channel has silted in over time and is of very limited value to fish and other aquatic species. Because of side channel value to fish, compounded with the lack of side channel habitat on the Illinois Waterway, this may be a very desirable feature. However, several factors contributed to this feature not being further evaluated. The material filling the channel consists of silt along with a large amount of timber and other debris. The quantity of material would be less than half of the quantity required for construction of the deflection dike. The island is privately owned and acquisition of the property is not a high priority for the sponsor. Adding aquatic habitat value outside of the refuge was not one of the major objectives.

6. EVALUATION OF FEATURES

Environmental Output Evaluation. A habitat evaluation was completed for the Rice Lake Habitat Rehabilitation and Enhancement Project (HREP), with a project goal of enhancing wetland, aquatic, and terrestrial habitats (Appendix D). The appraisal guides for wetland, aquatic, and upland habitats were chosen, with a total of 21 species selected for evaluation. The evaluation study team consisted of staff from the Illinois DNR, the USFWS, and the Corps of Engineers.

Habitat evaluation procedures were used to optimize the potential of each enhancement feature. The procedure chosen for habitat evaluation was developed by the Missouri Department of Conservation and the Soil Conservation Service. The system, the Wildlife Habitat Appraisal Guide (WHAG), is a numerical habitat appraisal system based on USFWS Habitat Evaluation Procedures (HEP) (1980). The system is used to evaluate existing habitat conditions and the effects of planned habitat management features.

The WHAG model uses the equation,

HSI x Acres = HUs

Where,

HSI = habitat suitability index (a quality measurement)
Acres = area (a quantity measurement)
HU = habitat units

as a measurement to quantify habitat output in the form of HUs.

Changes in HUs will occur as a habitat matures naturally or is influenced by development. These changes influence the cumulative HUs derived over the life of the project. Cumulative HUs are annualized and averaged. This calculation determines what is known as Average Annual Habitat Units (AAHUs). AAHUs are used as the output measurement to compare all the features and project as a whole.

Table 6-1 shows each potential enhancement feature and its respective output measured in average annual habitat units (AAHUs) if the feature were to be implemented.

Because the project would be a habitat restoration effort and not mitigation for habitat losses occurring elsewhere, there were no numerical habitat goals per se as part of the project objectives. Although optimal conditions would be welcomed at Rice Lake SFWA, these conditions are neither physically attainable nor affordable. The goal of this project is to produce the highest environmental output at a reasonable and acceptable cost to the Corps of Engineers and the Illinois DNR.

a. Perimeter Water Control Dike. The ability to control water levels in the lakes and other management units of the Rice Lake SFWA is critical to meeting management goals and objectives for the site. In order to provide water level control to the Big Lake portion of the area, construction of a low height water control dike along the eastern perimeter of the project area is required. This structure would protect interior areas from the frequent midsummer stage fluctuations characteristic of the current Illinois River water level regime, and would increase the probability of maintaining seasonal operating levels as described in Section 3(b). In the six-month period when water level control is critical (mid-June through early December each year), protection from fluctuating river levels means a greater success rate for planted or naturally occurring moist-soil food plants. Two essential components of this feature are a spillway structure located in the dike alignment at the southern end of Goose Lake, and two gated 60-inch-diameter culverts leading from Goose Lake out to the Illinois River. The purpose of the spillway is to protect the earthen portions of the water control dike from erosion during rising and falling river stages. The purpose of the gated culverts is to allow gravity drawdown of Big Lake and Goose Lake.

(A1) Dike at Elevation 440. This alternative would involve constructing the perimeter water control dike with a top elevation of 440 and a spillway crest elevation of 438. Gravity drawdown of the Big Lake portion of the project area would be possible when river stage is below elevation 438; drawdown could be maintained as long as river stage remained below elevation 438. This structure would provide a slight increase in operating flexibility for the Rice Lake portion, but no added protection from river stage fluctuations.

(A2) Dike at Elevation 442. This alternative would involve constructing the perimeter water control dike with a top elevation of 442 and a spillway crest elevation of 440. Drawdown of the Big Lake portion of the project area could be maintained as long as river stage remained below elevation 440. This structure would provide a slight increase in operating flexibility for the Rice Lake portion, and would provide some additional protection from river stages below elevation 440.

b. Water Level Management Capability. The purpose of water level management is twofold. First, the ability to maintain water levels in the management units of the Rice Lake SFWA independent of river stage fluctuations as discussed in Section 6(a) above is essential. Second, the ability to manipulate interior water levels by drawing down and reflooding in accordance with the operating plan is critical to meeting the project objective. In some years, the river stage may not be low enough to allow drawdown by gravity drainage at the scheduled time. In other years, fall river stages may be too low to reflood the project area by gravity inflow. The additional pumping and drainage capacity proposed for the project would allow management of water levels in Big Lake and Goose Lake by pumping when river levels are not conducive to management by gravity flow.

A new pump station would be constructed above the old Copperas Creek lock as shown on plate 2. The location of the pump station was chosen to allow accessible water conveyance without recurrent maintenance dredging problems. Several thousand feet of ditches are required to convey the water to and from the lakes. These ditch sections will be constructed by a combination of mechanical excavation and embankment placement. Two alternatives were considered to optimize the pump station.

(B1) Pumping Facility for Big Lake. This alternative would involve installation of 50,000 gpm pumping capacity at the new station mentioned above. The existing pump station would remain to supply Rice Lake. This alternative would provide the capability to manipulate water levels on Big Lake, while separately maintaining the existing water level management facilities on Rice Lake.

(B2) Pumping Facility for Big Lake and Rice Lake. This alternative would involve abandoning the existing Rice Lake pump station, and installing a 100,000 gpm capacity pump at the new station. The existing Rice Lake pump station has a capacity of approximately 50,000 gpm and was designed to raise Rice Lake two feet within a 21-day period. The inlet channel to the existing pump station is a 3,900-foot channel from the Illinois Waterway. This channel requires maintenance dredging approximately once every 3 years. Adjacent dredged material placement has become an increasing problem. Abandonment of the existing pump station and replacement of its function at the new pumping station would optimize management and operational flexibility for the entire project area, and would reduce maintenance costs.

c. Terrestrial Habitat Enhancement. The Rice Lake site is currently dominated by two land cover types, open water and woody terrestrial. This feature would provide additional terrestrial habitat diversity and would aid the Illinois DNR in meeting secondary management objectives for the Rice Lake SFWA, specifically to conserve natural bottomland habitat of migratory and resident game and non-game fauna and native flora inhabiting the site, including rare, threatened, and endangered species. This feature would convert a portion of the cropland on the Duck Island peninsula to one or more native cover types. Development of this feature would require acquisition of the Duck Island peninsula, which is currently a privately owned inholding in the project area. Alternative enhancement plans evaluated for this feature are described below:

(C1) Warm Season Grass Planting. Approximately 200 acres of the land on Duck Island that is currently being used for agricultural purposes will be planted with a mixture of warm season grasses. Species selected include big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*) sideoats grama (*Bouteloua curtipendula*), and perennial rye grass (*Lolium perenne*) as a cover crop. This alternative would add to the diversity of herbaceous vegetation in the project area without compromising the primary management objective of the project area.

(C2) Warm Season Grass/Mast Tree Planting. This alternative would include the 200-acre grass planting described above, and also would convert an additional 100 acres of Duck Island cropland to forest cover through planting of mast-producing tree species. Because the area to be planted is currently in agricultural production it will be ideal for mast tree establishment because minimal site preparation would be required. This alternative would enhance the habitat value of forest resources in the project area by introducing a component of mast-producing species into a forest dominated by silver maple and cottonwood. Species to be planted would include pin oak, swamp white oak, bur oak, pecan, and sycamore. Duck Island is the highest area in the Rice Lake Wildlife Area and best suited to support trees that are moderately tolerant of flooding.

d. Fish Egress Structure (D1). The existing physical parameters of Rice Lake and the operational constraints of management for moist-soil plant production have severely limited composition and survival of fish populations. Yearly fall population analyses indicate very poor fish survival through the summer, with carp and goldfish constituting 99 percent of the fish collected. Development of this alternative feature would involve construction of a gated 60-inch-diameter CMP culvert under the access road on the west side of the Duck Island peninsula. This structure would be operated to allow fish to move out of Rice Lake into the gravel pit on Duck Island, providing fish in Rice Lake an access to deep water areas during summer drawdown periods and increasing the potential for fish survival. The Rice Lake SFWA has experienced outbreaks of avian botulism attributed in part to the reduction of water levels in the upper lake. The fish egress structure also could indirectly benefit waterfowl by reducing the potential for fish kills related to water reduction (and decaying organic matter associated with the fish carcasses), thereby reducing the potential for recurrence of avian botulism.

e. Cost Estimates for Habitat Improvement Measures. Table 6-1 shows the cost per feature. A breakdown of costs is outlined in Section 15 - Cost Estimates. Costs were annualized and are based on construction and real estate estimates.

TABLE 6-1

Potential Project Features - Outputs and Costs

Feature	Symbol	Output*	Cost**
Water Control Dike			
no action	A0	0	0
dike at el. 440	A1	1877.7	103
dike at el. 442	A2	2081.8	123
Water Level Management			
no action	B0	0	0
50,000 gpm pump	B1	938.80	65
100,000 gpm pump	B2	2000.10	115
Terrestrial Habitat			
no action	CO	0	0
grassland planting	C1	264.4	150
grass/mast trees	C2	1131.7	152
Fish Egress Culvert			
no action	D0	0	0
60-inch gated culvert	D1	5501.10	124

* Outputs are calculated as Average Annual Habitat Units.
** Costs in $1,000s and are annualized.

7. FORMULATION OF ALTERNATIVES

a. General Discussion. In restoration and enhancement projects like the Rice Lake project, incremental analysis is an excellent tool to evaluate and determine what management measures should be built based on habitat benefit outputs that meet the goals and objectives of the project and at the same time are the most cost-effective. The Corps of Engineers has incorporated incremental analysis into its planning documents for some time, mostly in mitigation planning.

Incremental analysis is basically a three-step procedure: (1) calculate the environmental outputs of each feature; (2) determine a cost estimate for each feature; and (3) combine the features to evaluate the best overall project alternative based on habitat benefits and cost. While cost and environmental output are necessary factors, other factors such as constructibility and meeting the goals and objectives of the sponsor are very important in deciding on the preferred alternative.

Several steps were taken to incrementally analyze this project. The project was evaluated using guidance prepared by the Corps of Engineers' Institute for Water Resources (Carlson, 1993; Orth, 1993; and Orth, 1994).

b. Potential Alternatives. For those management measures that are dependent on each other, all possible combinations of their features were evaluated to determine the most cost efficient and effective alternatives. Table 7-1 lists all the possible combinations.

TABLE 7-1

Ranked Combinations

Ranked Combinations*	Output**	Cost***
A0+B0+C0+D0	0	0
A1+B0+C0+D0	1877.7	103.0
A1+B1+C0+D0	1877.7	168.0
A1+B2+C0+D0	1877.7	218.0
A2+B0+C0+D0	2081.8	123.0
A1+B0+C1+D0	2142.1	253.0
A1+B1+C1+D0	2142.1	318.0
A1+B2+C1+D0	2142.1	368.0
A2+B0+C1+D0	2346.2	273.0
A1+B0+C2+D0	3009.4	255.0
A1+B1+C2+D0	3009.4	320.0
A1+B2+C2+D0	3009.4	370.0
A2+B1+C0+D0	3020.6	188.0
A2+B0+C2+D0	3213.5	275.0
A2+B1+C1+D0	3285.0	338.0
A2+B2+C0+D0	4081.9	238.0
A2+B1+C2+D0	4152.3	340.0
A2+B2+C1+D0	4346.3	388.0
A2+B2+C2+D0	5213.6	390.0
A1+B0+C0+D1	7378.8	227.0
A1+B1+C0+D1	7378.8	292.0
A1+B2+C0+D1	7378.8	342.0
A2+B0+C0+D1	7582.9	247.0
A1+B0+C1+D1	7643.2	377.0
A1+B1+C1+D1	7643.2	442.0
A1+B2+C1+D1	7643.2	512.0
A2+B0+C1+D1	7847.3	397.0
A1+B0+C2+D1	8510.5	379.0
A1+B1+C2+D1	8510.5	444.0
A1+B2+C2+D1	8510.5	494.0
A2+B1+C0+D1	8521.7	312.0
A2+B0+C2+D1	8714.6	399.0
A2+B1+C1+D1	8786.1	462.0
A2+B2+C0+D1	9583.0	362.0
A2+B1+C2+D1	9653.4	464.0
A2+B2+C1+D1	9847.4	512.0
A2+B2+C2+D1	10714.7	514.0

* See Section 6 for detailed description of combinations.
** Outputs are calculated as Average Annual Habitat Units.
*** Costs in $1,000s and are annualized.

8. EVALUATION OF ALTERNATIVES

Plans within measures (two water control plans, for example) cannot be combined to form an alternative. A total of 37 combinations was formed, including the no action alternative. Because the water control dike is considered an essential component of any HREP project at Rice Lake, only those combinations which included one of the water control dike plans were included in the incremental analysis.

water control dike		pump station		plantings		fish egress		
2	x	3	x	3	x	2	=	36
						no action	=	1
				total number of alternatives			=	37

Table 8-1 displays the combinations in their ascending order based on their respective outputs. Those combinations shaded were deemed to be cost inefficient for the amount of output produced. These alternatives were no longer evaluated. The combinations that are unshaded are presented in Table 8-2. These combinations are the least cost combinations for each level of output.

TABLE 8-1

Identification of Combinations That Are Economically Inefficient

Ranked Combinations	Output*	Cost**
A0+B0+C0+D0	0	0
A1+B0+C0+D0	1877.7	103.0
A1+B1+C0+D0	1877.7	168.0
A1+B2+C0+D0	1877.7	218.0
A2+B0+C0+D0	2081.8	123.0
A1+B0+C1+D0	2142.1	253.0
A1+B1+C1+D0	2142.1	318.0
A1+B2+C1+D0	2142.1	368.0
A2+B0+C1+D0	2346.2	273.0
A1+B0+C2+D0	3009.4	255.0
A1+B1+C2+D0	3009.4	320.0
A1+B2+C2+D0	3009.4	370.0
A2+B1+C0+D0	3020.6	188.0
A2+B0+C2+D0	3213.5	275.0
A2+B1+C1+D0	3285.0	338.0
A2+B2+C0+D0	4081.9	238.0
A2+B1+C2+D0	4152.3	340.0
A2+B2+C1+D0	4346.3	388.0
A2+B2+C2+D0	5213.6	390.0
A1+B0+C0+D1	7378.8	227.0
A1+B1+C0+D1	7378.8	292.0
A1+B2+C0+D1	7378.8	342.0
A2+B0+C0+D1	7582.9	247.0
A1+B0+C1+D1	7643.2	377.0
A1+B1+C1+D1	7643.2	442.0
A1+B2+C1+D1	7643.2	512.0
A2+B0+C1+D1	7847.3	397.0
A1+B0+C2+D1	8510.5	379.0
A1+B1+C2+D1	8510.5	444.0
A1+B2+C2+D1	8510.5	494.0
A2+B1+C0+D1	8521.7	312.0
A2+B0+C2+D1	8714.6	399.0
A2+B1+C1+D1	8786.1	462.0
A2+B2+C0+D1	9583.0	362.0
A2+B1+C2+D1	9653.4	464.0
A2+B2+C1+D1	9847.4	512.0
A2+B2+C2+D1	10714.7	514.0

* Outputs are calculated as Average Annual Habitat Units.
** Costs in $1,000s and are annualized.

TABLE 8-2

Combinations That Are Economically Efficient

Ranked Combinations	Output*	Cost**
A0+B0+C0+D0	0.00	0
A1+B0+C0+D0	1877.7	103.0
A2+B0+C0+D0	2081.8	123.0
A1+B0+C1+D0	2142.1	253.0
A2+B0+C1+D0	2346.2	273.0
A1+B0+C2+D0	3009.4	255.0
A2+B1+C0+D0	3020.6	188.0
A2+B0+C2+D0	3213.5	275.0
A2+B1+C1+D0	3285.0	338.0
A2+B2+C0+D0	4081.9	238.0
A2+B1+C2+D0	4152.3	340.0
A2+B2+C1+D0	4346.3	388.0
A2+B2+C2+D0	5213.6	390.0
A1+B0+C0+D1	7378.8	227.0
A2+B0+C0+D1	7582.9	247.0
A1+B0+C1+D1	7643.2	377.0
A2+B0+C1+D1	7847.3	397.0
A1+B0+C2+D1	8510.5	379.0
A2+B1+C0+D1	8521.7	312.0
A2+B0+C2+D1	8714.6	399.0
A2+B1+C1+D1	8786.1	462.0
A2+B2+C0+D1	9583.0	362.0
A2+B1+C2+D1	9653.4	464.0
A2+B2+C1+D1	9847.4	512.0
A2+B2+C2+D1	10714.7	514.0

* Outputs are calculated as Average Annual Habitat Units.
** Costs in $1,000s and are annualized.

Table 8-3 identifies those combinations that are ineffective. Unshaded combinations produce more output for less cost (Table 8-4).

TABLE 8-3

Ineffective Combinations Identified

Ranked Combinations	Output*	Cost**
A0+B0+C0+D0	0.00	0
A1+B0+C0+D0	1877.7	103.0
A2+B0+C0+D0	2081.8	123.0
A1+B0+C1+D0	2142.1	253.0
A2+B0+C1+D0	2346.2	273.0
A1+B0+C2+D0	3009.4	255.0
A2+B1+C0+D0	3020.6	188.0
A2+B0+C2+D0	3213.5	275.0
A2+B1+C1+D0	3285.0	338.0
A2+B2+C0+D0	4081.9	238.0
A2+B1+C2+D0	4152.3	340.0
A2+B2+C1+D0	4346.3	388.0
A2+B2+C2+D0	5213.6	390.0
A1+B0+C0+D1	7378.8	227.0
A2+B0+C0+D1	7582.9	247.0
A1+B0+C1+D1	7643.2	377.0
A2+B0+C1+D1	7847.3	397.0
A1+B0+C2+D1	8510.5	379.0
A2+B1+C0+D1	8521.7	312.0
A2+B0+C2+D1	8714.6	399.0
A2+B1+C1+D1	8786.1	462.0
A2+B2+C0+D1	9583.0	362.0
A2+B1+C2+D1	9653.4	464.0
A2+B2+C1+D1	9847.4	512.0
A2+B2+C2+D1	10714.7	514.0

* Outputs are calculated as Average Annual Habitat Units.
** Costs in $1,000s and are annualized.

TABLE 8-4

Cost-Effective Least Cost Combinations

Ranked Combinations	Output*	Cost**
A0+B0+C0+D0	0.00	0
A1+B0+C0+D0	1877.7	103.0
A2+B0+C0+D0	2081.8	123.0
A2+B1+C0+D0	3020.6	188.0
A1+B0+C0+D1	7378.8	227.0
A2+B0+C0+D1	7582.9	247.0
A2+B1+C0+D1	8521.7	312.0
A2+B2+C0+D1	9583.0	362.0
A2+B1+C2+D1	9653.4	464.0
A2+B2+C1+D1	9847.4	512.0
A2+B2+C2+D1	10714.7	514.0

* Outputs are calculated as Average Annual Habitat Units.
** Costs in $1,000s and are annualized.

At this point, average cost per AAHU is calculated (Table 8-5). The combination A1+B0+C0+D1 is shaded in Table 8-5. This alternative has the lowest average cost and is the first to be included in the incremental cost analysis. Levels of output less than the lowest average cost level (A1+B0+C0+D1) are dropped from further analysis.

TABLE 8-5

Average Cost of Each Level Output

Ranked Combinations	Output*	Cost**	Average Cost $ per AAHU
A0+B0+C0+D0	0.00	0	
A1+B0+C0+D0	1877.7	103.0	0.0549
A2+B0+C0+D0	2081.8	123.0	0.0591
A2+B1+C0+D0	3020.6	188.0	0.0622
A1+B0+C0+D1	7378.8	227.0	0.0308
A2+B0+C0+D1	7582.9	247.0	0.0326
A2+B1+C0+D1	8521.7	312.0	0.0366
A2+B2+C0+D1	9583.0	362.0	0.0378
A2+B1+C2+D1	9653.4	464.0	0.0481
A2+B2+C1+D1	9847.4	512.0	0.0520
A2+B2+C2+D1	10714.7	514.0	0.0480

* Outputs are calculated as Average Annual Habitat Units.
** Costs in $1,000s and are annualized.

Next, the question is asked: Of the remaining levels of output, which level has the lowest average cost for additional output? Using combination A1+B0+C0+D1 as the "zero level," additional costs and additional outputs of the other combinations were calculated in Table 8-6. Again, the lowest average cost combination is highlighted (A2+B2+C0+D1) and is the second combination added to the incremental analysis. Those combinations with lower levels of output are dropped from the analysis.

TABLE 8-6

Average Cost for Additional Output, First Recalculation

Ranked Combinations	Output*	Addl. Output	Cost**	Addl. Cost	Avg. Cost for Addl. Output $ per AAHU
A1+B0+C0+D1	7378.8	0.0	227.0	0	
A2+B0+C0+D1	7582.9	204.1	247.0	20	0.10
A2+B1+C0+D1	8521.7	1142.9	312.0	85	0.07
A2+B2+C0+D1	9583.0	2204.2	362.0	135	0.06
A2+B1+C2+D1	9653.4	2274.6	464.0	237	0.10
A2+B2+C1+D1	9847.4	2468.6	512.0	285.0	0.12
A2+B2+C2+D1	10714.7	3335.9	514.0	287.0	0.09

* Outputs are calculated as Average Annual Habitat Units.
** Costs in $1,000s and are annualized.

A final reiteration is completed with the remaining combinations that have a higher level of output than Combination A2+B2+C0+D1. In this analysis, three combinations remain. Table 8-7 highlights the combination with the lowest average cost (A2+B2+C2+D1).

TABLE 8-7

Average Cost for Additional Output, Second Recalculation

Ranked Combinations	Output*	Addl. Output	Cost**	Addl. Cost	Avg. Cost for Addl. Output $ per AAHU
A2+B2+C0+D1	9583.0	0.00	362.0	0	
A2+B1+C2+D1	9653.4	70.40	464.0	102.0	1.45
A2+B2+C1+D1	9847.4	264.40	512.0	150.0	0.57
A2+B2+C2+D1	10714.7	1131.70	514.0	152.0	0.13

* Outputs are calculated as Average Annual Habitat Units.
** Costs in $1,000s and are annualized.
shading = lowest average cost for additional output.

Table 8-8 displays the four combinations that had the lowest average cost (highlighted combinations from Tables 8-5, 8-6, and 8-7, as well as the no action alternative), and the incremental costs of these combinations. Figure 8-1 graphically displays this data. The preferred alternative that best meets the management objectives of the resource agencies is also determined.

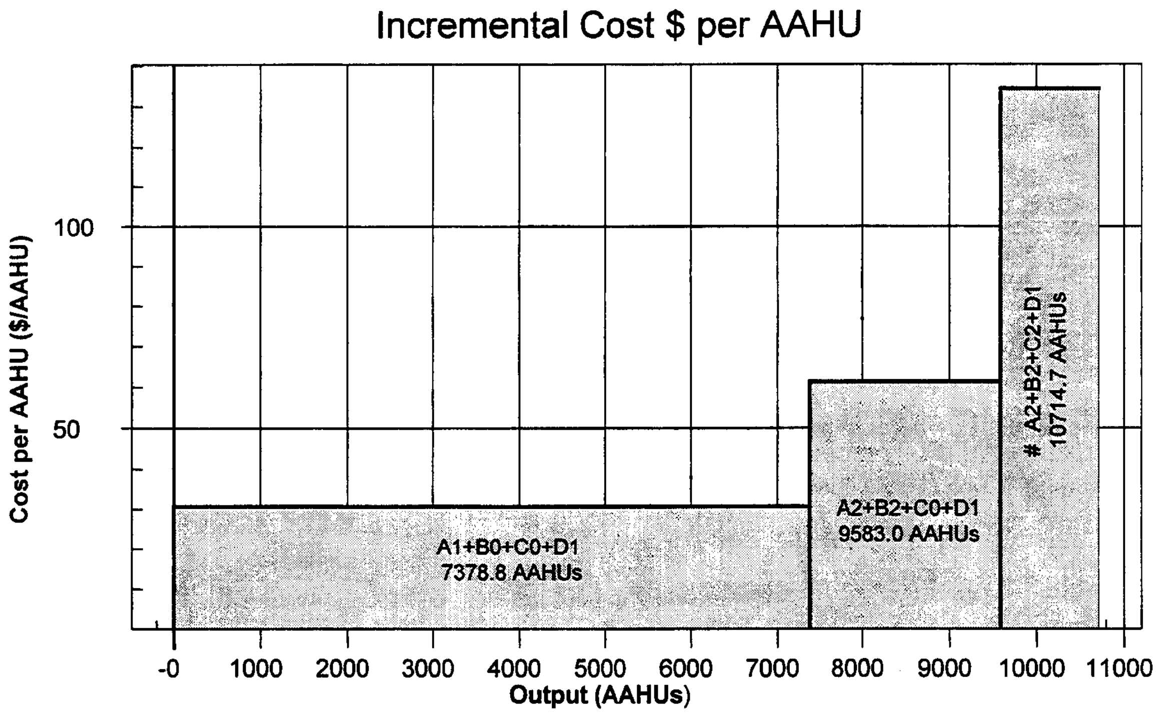
TABLE 8-8

Supply Schedule, Incremental Costs

Ranked Combinations	Output*	Cost**	Addl. Output	Addl. Cost	Incremental Cost $ per AAHU
A0+B0+C0+D0	0	0			
A1+B0+C0+D1	7378.8	227.0	7378.8	227	0.03
A2+B2+C0+D1	9583.0	362.0	2204.20	135	0.06
# A2+B2+C2+D1	10714.7	514.0	1131.70	152	0.13

* Outputs are calculated as Average Annual Habitat Units.
** Costs in $1,000s and are annualized.
\# Preferred Alternative

FIGURE 8-1



Preferred Alternative

Incremental Analysis Summary. The incremental analysis methodology used, Nine Easy Steps, provides for a very complete analysis of the project's output and costs even though the litany of combinations and tables can become confusing at times. Other elements adding to the complexity of the analysis are the goals and objectives of the project as well as the landscape of the site. For large, dynamic projects like Rice Lake, presenting the data in a concise manner is a challenge. However, the Nine Easy Steps methodology hopefully presents the data in a clear and understandable fashion.

Federal planning for water resources development is conducted in accordance with the requirements of *the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (P&G). The P&G provide a decision rule for selecting a recommended plan where both outputs and costs are measured in dollars. This rule states that "the alternative plan with the greatest net economic benefit consistent with protecting the Nation's environment (National Economic Development Plan, NED Plan) is to be selected..." (paragraph 1.10.2). There is no similar rule for plan selection where outputs are not measured in dollars, as is the case in planning for restoration and mitigation.

Neither cost effectiveness analysis nor incremental cost analysis include a plan selection rule similar to the NED rule. In the absence of such a decision making rule, neither analysis will indicate what choice to make. However, the information developed by both analyses will help in making better informed decisions and, once a decision is made, will help in better understanding its consequences in relation to other choices.

While the incremental cost analysis identified those alternatives that are the most cost effective, and as stated above, provides excellent information to the decision maker, this procedure should not be the sole source on which to base a decision. Other factors considered in this analysis were landscape of the site (including physical dynamics associated with the riverine environs), management objectives of the resource agencies, critical needs of the region, and ecosystem needs of the Upper Mississippi River System.

In cooperation with the Illinois DNR, FWIC, and USFWS, the Corps has planned and designed an alternative that serves the needs of the resources and resource managers, while being cost conscious. The preferred alternative, A2+B2+C2+D1, has an overall output of 10,715 AAHUs for a total cost of approximately $7,155,286.

The question posed to the agencies involved in this analysis was, "Is the cost of the increment in output worth the added costs?" The Illinois DNR and the Rock Island District believe that alternative A2+B2+C2+D1 meets the goals and objectives of each agency and the EMP program. While the individual features of other alternatives would address the goals and objectives of the project, the other cost-effective alternatives did not strike the right balance of habitat benefits for the overall project.

9. DETAILED DESCRIPTION OF PREFERRED ALTERNATIVE

The preferred alternative meets the goals and objectives of the Illinois DNR for wildlife management at Rice Lake. This alternative also is the most cost-efficient alternative to meet these goals. This alternative includes dike construction at the southwest portion of the project, a new pump station construction near the historic Copperas Creek lock site, channel excavation to convey water from the pump station to the lakes, fish egress structure between Rice Lake and the gravel pits, and tree and native grass plantings on Duck Island.

a. General Description. Features A2, B2, C2 and D1 were selected as the recommended project to be constructed. The recommended project features include dike construction, pump station construction, culvert installation, mast tree planting and native grass planting.

b. Perimeter Water Control Dike Construction. A dike with a 2,500-foot riprap spillway will be constructed across the lower opening of Goose Lake. The dike will be constructed to an elevation of 442 NGVD with the riprapped spillway built to elevation 440. This elevation corresponds to less than a 2-year level of protection. The side slopes of the dike will be constructed to a minimum 5 horizontal feet on 1 vertical feet. The top will be a minimum 10 feet. Two 60-inch gated culverts will be installed in the dike to allow gravity drainage when possible.

c. Pump Station Construction. A new 100,000 gpm concrete pump station will be constructed. To reduce power requirements, allow for flexibility, and reduce operating expenses, three 34,000 gpm pumps will be installed as shown on plate 12. The building will provide a weather-tight, vandal-resistant enclosure. The intakes to the pump station will be provided with steel trash racks to protect the pump from debris. Over 20,000 feet of channel excavation will be completed to convey the water between the pump station and the project's lakes.

d. Fish Egress Structure. A 60-inch-diameter gated culvert will be placed as shown on plate 2. This structure will be designed to provide passage of fish from Rice Lake to the gravel pits during the periods of drawdown.

e. Mast Tree and Grass Planting. Approximately 300 acres will be planted in mast trees and native grasses. The site of the planting will be the west half of the approximately 600 acres on Duck Island that are currently in agricultural use.

Native warm season grasses will be planted on approximately 200 acres of the site. The native grass mixture will include big bluestem (*Andropogon gerardii*) little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), side oats grama (*Bouteloua curtipendula*), and perennial rye grass (*Lolium perenne*).

Planting will begin in the spring no earlier than March 15th and will be completed no later than May 5th. If planted in the fall, starting and ending dates will be October 1st and November 15th, respectively. Species will be intermixed to avoid solid blocks of individual species.

Mast tree plantings will occur on approximately 100 acres of the site. Pin oak, swamp white oak, bur oak, pecan and sycamore will be planted on a 30-foot spacing. Species will be intermixed at each site to avoid solid blocks of individual species.

Large stock seedlings greater than 4 feet in height will be planted. The tree plantings will be spaced and distributed to allow for a natural appearance. Ground disturbance for mast tree planting will involve disking to a depth of 4 inches, followed by excavation of planting holes.

A cover crop of red top grass and annual grains will be established in the tree planting sites to help control unwanted weed species. Herbicides will be used, if necessary to control any competing vegetation that threatens the survival of the planted trees. Following a 3-year establishment period, the surrounding ground in all mast tree planting areas will be allowed to assume natural growth.

10. DESIGN AND CONSTRUCTION CONSIDERATIONS

a. Existing Site Elevations. The entire Rice Lake project area is located within the floodplain of the Illinois Waterway. Flat pool elevation is 429 NGVD. The land surface elevation in the designated borrow areas ranges from 434 to 438. It is anticipated that shallow borrow and subsequent embankment construction can be accomplished using traditional earth-moving equipment. Dewatering likely will be required for foundation work associated with the pump station structures.

b. Borrow Sites/Construction Materials.

(1) Borrow Sites. Borrow material for the core of the perimeter water control dike will come from sand dredged from the main channel of the Illinois River as a result of normal channel maintenance activities. The sand will be stockpiled as indicated on plate 2. Borrow for topsoil shall be obtained from strip material that is free of objectionable material or shall be trucked in.

(2) Construction Materials. Only common construction materials are required for this project. Crushed stone and ready mix materials are available locally and can be trucked to the site. Riprap is available from Valley City Quarry, Valley City, Illinois, and can be barged or trucked to the site. Construction areas are easily accessible, and construction materials can be transported on site by conventional equipment.

c. Storm Water Pollution/Erosion Control. The potential for storm water pollution during construction is minimal for this project. Storm water runoff from the majority of the disturbed areas will be contained within the Rice Lake SFWA. Temporary stabilization measures will be employed on disturbed areas of the water control dike until final seeding and stabilization occurs. Stabilization practices may include mulching, temporary seeding, and/or the erection of silt fencing. Overall, the long-term storm water runoff characteristics of the site are not expected to change; all disturbed areas will be reseeded with similar vegetation types as before project conditions .

d. Construction Sequence. The probable construction sequence is summarized in Table 10-1. The contractor will be required to complete the perimeter water control dike construction prior to initiating any of the other project features.

TABLE 10-1

Water Control Dike Probable Construction Sequence

Construction Work Item	Instructions	Purpose
Place dredged material in the designated stockpile area.	The stockpile area will be sited to avoid the removal of any trees. No clearing or stripping are required.	Obtain material to construct the water control dike.
Clear and grub specified vegetation from water control dike foundation.	Place debris in piles adjacent to landside toe. Stockpile area will be returned to original elevation and contours (i.e., all dredged material removed) to minimize adverse effects to drawdown areas.	
Move, place, and shape stockpiled embankment.		
Place riprap where specified.		Provide overflow protection.
Implement temporary soil stabilization practices on riverside slopes of perimeter levee.	Required only if time between final levee shaping and initial seeding exceeds 21 days.	To minimize storm water pollution potential.
Seed levee.		

e. Permits. A public notice, as required by Section 404 of the Clean Water Act, will be made prior to submission of this report for final approval. A Section 401 water quality certificate from the State of Illinois and a Section 404(b)(l) Evaluation will be included in the final submission of this report (Appendix B). Because all land disturbances associated with this project are addressed in the 404(b)(l) Evaluation, a National Pollutant Discharge Elimination System (NPDES or Section 402) permit for storm water discharges will not be required.

f. Historic Properties. See Section 11d. of the DPR for a discussion of design and construction considerations pertaining to historic properties.

11. ENVIRONMENTAL EFFECTS

a. Summary of Effects. The Rice Lake SFWA is a large and complex site with a variety of resources that vary in quantity and quality. The goal for the site is to raise the quality of wetland, aquatic, and terrestrial habitat. In the case of proposed wetland and aquatic habitat enhancement, no alteration of habitat type is anticipated, with the exception of the immediate construction sites for water level management structures. The enhancement measures are expected to have a net positive effect on the quality of existing habitat in the project area. In the case of proposed terrestrial habitat enhancement, a portion of one habitat type (cropfield on Duck Island) would be altered in order to increase the quantity of two other habitat types (warm season grassland and mast-dominant floodplain forest). These proposed alterations in habitat quality and quantity would help to fulfill management objectives to meet the State's goals for the site, as outlined in Section 3(b) of this DPR.

The primary objectives of the Rice Lake HREP are to increase the rate of success of emergent and moist-soil vegetation, increase food and shelter for wildlife, increase food and cover for terrestrial birds and mammals, and increase fish egress from Rice Lake during drawdown. The first two objectives would be achieved through reconstructing the Hate Levee and extending the structure to the access road on the east side of the project area, thereby establishing a perimeter water control dike to protect the project area from minor water level fluctuations on the Illinois River and maintain desired water levels in the project area. Development of a new pumping facility and associated drainage structures also would help to achieve these objectives by improving water level management capability in the project area. Increase of terrestrial food and cover would be achieved through conversion of approximately 300 acres of cropland on Duck Island to a combination of warm season grassland habitat (200 acres) and mast-dominated forest habitat (100 acres). Increased fish egress from Rice Lake during drawdown would be achieved by construction of gated culverts on Duck Island to allow fish passage from Rice Lake to deepwater areas in the Duck Island gravel pit.

Operation of the project to meet the management objectives of the Rice Lake SFWA is expected to have a positive effect on natural floodplain values. Because the water control dike would provide only a low level of flood protection, no measurable change in floodplain storage is anticipated and no change in flood heights is expected to result from this action. The project is expected to have a net positive effect on wetland wildlife habitat. No loss of existing wetland functions or values is expected to occur in the project area.

b. Economic and Social Impacts.

(1) Community and Regional Growth. No short-term or long-term impacts to the growth of the neighboring community or region will be realized as a result of the project. The project will improve recreation opportunities at the Rice Lake SFWA, increasing the attractiveness of the area for wildlife observation, waterfowl hunting, sport fishing, camping, canoeing, photography, and commercial fishing.

(2) Community Cohesion. The proposed wildlife habitat restoration project has positive impacts on community cohesion as the wildlife area attracts many visitors and recreationists from other communities. Overall, the project will have no adverse impacts to the quality of the human environment.

(3) Displacement of People. The project is not expected to result in any residential relocations.

(4) Property Values and Tax Revenues. Approximately 600 acres on Duck Island are currently leased for crop production. The project proposes to use half of the acreage for mast tree plantings and warm season grass plantings, thus removing the acreage from production and from the tax rolls.

(5) Public Facilities and Services. The Rice Lake SFWA attracts over 150,000 visitors each year. The proposed wildlife habitat restoration project will positively impact public facilities and services by enhancing outdoor recreational opportunities.

(6) Life, Health, and Safety. The project poses no threats to the life, health, or safety of recreationists in the area.

(7) Business and Industrial Activity. No significant changes in business and industrial activities will occur during project construction. Long-term impacts to business and industrial development would be related to tourism and recreational activities.

(8) Employment and Labor Force. Short-term employment opportunities in the area may increase slightly during project construction. The project will not directly affect employment of the labor force in Fulton County, Illinois.

(9) Farm Displacement. No farms will be displaced as a result of the proposed project. Acquisition of Duck Island will remove 300 acres from crop production. This is leased land, and is not a main source of income for the tenant.

(10) Aesthetic Values. The enhancement of the wildlife area will ensure continued waterfowl utilization of the complex and surrounding areas, and make the complex more aesthetically pleasing to visitors.

(11) Noise Levels. Heavy machinery will generate a temporary increase in noise levels during project construction, disturbing wildlife and recreationists in the area. The project is located in an area with limited residential or other development, and no significant, long-term impacts will result.

c. Natural Resources Impacts. Effects of the project on natural resources were evaluated using WHAG (Urich, *et al.*, 1984) methodologies. These habitat evaluation methods were used during project planning to evaluate various features in terms of increased benefits to wildlife resources. Optimization of habitat units (HUs) in relation to project costs for target species is considered the goal of feature selection. Results of the habitat evaluations are summarized in Table 6-1, with a more detailed analysis in Appendix D. Assessment of project impacts also was based on experience and sound management practices.

The proposed water control dike will be constructed using hydraulically dredged sand from the Illinois River. The dike will be capped with a layer of earthen material and reseeded. Construction of the dike structure will require clearing approximately 10 acres of bottomland hardwood vegetation, primarily second growth silver maple with occasional large cottonwoods. Following construction, the dike will be reseeded with flood-tolerant grass species to control erosion and protect the integrity of the structure. Construction of pumping and drainage facilities will occur in areas that have been previously disturbed. Approximately 32 acres of primarily woody vegetation will be cleared for construction of drainage channels. Cleared areas will be allowed to naturally revegetate. Clearing in these areas will be minimized and no permanent changes in vegetative cover are anticipated. Operation of the project will not create conditions new to the plant species bordering the water level management structures.

(1) Aquatic Resources. Additional discussion of aquatic and water quality impacts is contained in Appendix B - Clean Water Act, Section 404(b)(1) Evaluation.

Short-term construction activities would increase turbidity in the Illinois River as a result of hydraulic dredging of borrow material. A slight increase in turbidity in Goose Lake may occur during stockpiling of borrow material. The increased turbidity is expected to have negligible impact considering existing turbidity levels in the Illinois River and the backwaters of the Rice Lake SFWA. Construction of the water control dike would provide an opportunity for beneficial use of dredged material that otherwise does not exist in this immediate reach of the Illinois River. As indicated in the WHAG analysis, the fish passage structure should benefit fisheries by providing access to deepwater habitat during drawdown periods.

(2) Wetland and Terrestrial Resources. The proposed plan would benefit more than 3,054 acres of nonforested wetland/shallow aquatic habitat through enhancement of water level control capability. The primary benefits would be increased reliability of moist-soil food production and access to feeding areas during fall and spring migration. Migratory waterfowl, shorebirds and wading birds would benefit from more reliable feeding and resting areas. Muskrat populations should not be negatively affected, and would in fact be expected to benefit from an increase in emergent and moist-soil vegetation, as indicated by the WHAG analysis. Terrestrial resources would benefit from the increased habitat diversity provided by the proposed warm season grassland and mast tree planting.

(3) Endangered Species. The federally threatened bald eagle (*Haliaeetus leucocephalus*) occurs within the Rice Lake SFWA during the winter months. Construction of the water control dike is not expected to directly impact any trees regularly used by eagles during foraging activities. If necessary, construction activities will be scheduled for periods when few, if any, eagles are present (usually 1 April - 30 October). The U.S. Fish and Wildlife Service, in their Coordination Act Report (Appendix A), stated that the proposed project would not affect bald eagles or their habitats.

Decurrent false aster populations in the Rice Lake SFWA are not expected to be impacted by the proposed project. Impacts to the documented population located along the northern portion of the water control dike will be avoided by installing a temporary protective fence, if necessary, during construction work in the area.

d. Historic Properties. A draft report entitled *Phase I Intensive Archaeological Survey for Historic Properties Within the Upper Mississippi River System-Environmental Management Program (UMRS-EMP) for the Rice Lake State Conservation Area, Fulton County, West-Central, Illinois—DRAFT* (archeology draft report), dated November 1996, was prepared by the Illinois State Museum, Springfield, Illinois, under Corps Indefinite Quantities Contract No. DACW25-93-D-0014, Delivery Order No. 17. Page 25 of the archeology draft report documents 27 archeological sites within the 177.87 hectares (441.5 acres) directed by the contract, including 7 prehistoric isolate finds, 14 prehistoric sites, 1 historic site, and 5 mixed component historic and prehistoric sites, and that 4 of these sites are potentially eligible for listing to the National Register of Historic Places (NRHP): Site 11F2745, 11F2746, 11F2895, and 11F2886. Following the recommendations of the report, the Corps will provide a 30-meter easement along the perimeter of Sites 11F2745, 11F2746, 11F2895, and 11F2886, so that (1) the planting of trees with power planters does not impact the four sites, and (2) the roots of future mature trees do not grow into the sites.

In addition, the Corps has determined that the Copperas Creek Lock is individually eligible for listing to the NRHP under Criteria A and C. This lock was constructed by the Corps and the State of Illinois between 1873 and 1877 as part of the Illinois River navigation improvement and is presently owned by the city of Canton, Illinois. The history and significance of this lock and the NRHP eligible Multiple Property Chicago to Grafton, Illinois, Navigable Water Link, 1836-1945, is extensively documented in the Corps' October 1996 report entitled *Architectural and Engineering Resources of the Illinois Waterway between 130th Street in Chicago and La Grange, Volume I* (architectural draft report), prepared by American Resources Group Ltd., Carbondale, Illinois, under Indefinite Quantities Contract No. DACW25-93-D-0012, Delivery Order No. 23.

The proposed pump station feature is located approximately 100 meters from the closest point of the Copperas Creek Lock and is buffered by mature trees and undergrowth. Therefore, those significant characteristics of the Copperas Creek Lock under Criteria A and C (as documented within the architectural draft report) will remain. The primary visual boundaries of the lock are between the ground surface and waterline, while the proposed Pump Station will be visually hidden from Copperas Creek Lock by vegetation, and have a low profile well below extant tree height. By applying the Criteria of Effect under 36 CFR Part 800.9(a): "Protection of Historic Properties," the Corps determines that No Effect to the NRHP eligible Copperas Creek Lock would occur from the construction of the Rice Lake HREP and associated pump station feature.

The IHPA, Springfield, Illinois concurred with the recommendations of the draft archeology report prepared by Illinois State Museum, and with the Corps findings, recommendations, and determination of effect by letter dated December 6, 1996 (Appendix A, IHPA LOG# 961205001P-F). A final copy of the archeology report: *Phase I Intensive Archaeological Survey for Historic Properties Within the Upper Mississippi River System-Environmental Management Program (UMRS-EMP) for the Rice Lake State Conservation Area, Fulton County, West-Central, Illinois,* dated January 1997, was provided to the IHPA and the Illinois DNR, as evidence of the Rock Island District's compliance pursuant to Section 106 of the NHPA, and determination of No Effect pursuant to 36 CFR Part 800.5(b).

Be it that the Corps has met its legal and regulatory requirements and compliance. If any historic properties are encountered, uncovered, or discovered, indirectly or directly associated with the Rice Lake HREP construction, all disturbance activities will halt that could potentially affect the historic properties. The Corps will notify the IHPA to coordinate measures to determine significance, and avoid and minimize any potential effects to any significant historic properties.

e. Mineral Resources. No significant impacts to mineral resources are expected to occur as a result of this project. The remaining supply of aggregate material in the gravel pit facility is variously estimated from approximately 6,400 tons per acre to 9,000 tons per acre with approximately 375 acres estimated for potential mining. The mining activity on Duck Island has been seasonal and is subject to closure during high water. The minerals extracted are of average quality and when processed correctly meet the Illinois Department of Transportation standards. Future mining activity at the Duck Island gravel pit is not expected to be affected by the project.

f. Farmland Protection. There are approximately 600 acres of existing cropland on the Duck Island peninsula. Development of either the fish passage structure or the terrestrial enhancement feature, or both, would require purchasing a portion of the Duck Island property where project features are located. The proposed terrestrial habitat enhancement would reduce the amount of cropland on Duck Island by approximately 300 acres through planting of warm season grasses and mast producing trees. The remaining acreage would continue to be cropped. A U.S. Department of Agriculture Form AD-1006 was submitted to the Natural Resources Conservation Service (NRCS) for review. Full compliance under the Illinois Farmland Preservation Act has been completed.

g. Cumulative Impacts. Although minor short-term impacts are likely to occur to local and migratory animals during construction, no significant cumulative impacts are expected. The proposed habitat restoration measures should have long-term benefits to the fish and wildlife resources utilizing the site. This project, in concert with other EMP projects on the Illinois River, should counter other adverse impacts to the river ecosystem such as sedimentation, pollution, and general decline in riverine and floodplain habitat.

h. Adverse Impacts That Cannot Be Avoided. The most substantial unavoidable adverse impact would be the clearing of vegetation for construction of project features. The perimeter water control dike was designed to follow the alignment of the existing access road and the natural levee along the Illinois River. Construction of the dike primarily will involve placement of fill material in areas that currently are lower than the design crest elevation of 442. Clearing of existing vegetation, particularly mature woody vegetation, would be kept to a minimum. Approximately 10 acres of woody vegetation are expected to be cleared as a result of construction activities. Most of this clearing would occur along the downstream portion of the alignment, where more extensive filling would be required to meet the 442 crest elevation.

i. Short-Term Versus Long-Term Productivity. Construction activities would temporarily disrupt wildlife and human use of the project area. Long-term productivity for natural resource management would benefit considerably by the construction of this project. Long-term productivity would be enhanced through increased reliability of seasonal water levels, promoting the success of emergent and moist-soil vegetation and providing more dependable feeding and resting areas for migratory and resident wildlife. Overall habitat diversity would be increased, and both game and nongame wildlife species would benefit from the proposed project. In turn, both consumptive and nonconsumptive users would realize heightened opportunities for recreational use of the Rice Lake SFWA.

j. Irreversible or Irretrievable Resource Commitments. The purchase of materials and the commitment of man-hours, fuel, and machinery to perform the project are irretrievable. Other than the aforementioned, none of the proposed actions are considered irreversible.

k. Relationship of the Proposed Project to Land-Use Plans. The proposed project is in compliance with the Rice Lake SFWA Natural Resource Management Plan (IDOC, 1989). The proposed project is not in conflict with any land-use plans currently being used for the site.

l. Compliance With Environmental Statutes. Compliance with applicable statutes is summarized in Table 11-1.

TABLE 11-1

Relationship of Plans to Environmental Protection Statutes and Other Environmental Requirements

Federal Policies	Compliance
Archaeological and Historic Preservation Act, 16 U.S.C. 469, et seq.	Full compliance
Clean Air Act, as amended, 42 U.S.C. 1857h-7, et seq.	Full compliance
Clean Water Act, 33 U.S.C. 1857h-7, et seq.	Full compliance
Endangered Species Act, 16 U.S.C. 1531, et seq.	Full compliance
Federal Water Project Recreation Act, 16 U.S.C. 460-1(12), et seq.	Full compliance
Fish and Wildlife Coordination Act, 16 U.S.C. 601, et seq.	Full compliance
Land and Water Conservation Fund Act, 16 U.S.C. 460/-460/-11, et seq.	Not applicable
National Environmental Policy Act, 42 U.S.C. 4321, et seq.	Full compliance
National Historic Preservation Act, 16 U.S.C. 470a, et seq.	Full compliance
River and Harbors Act, 33 U.S.C. 403, et seq.	Full compliance
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq.	Not applicable
Wild and Scenic Rivers Act, 16 U.S.C. 1271, et seq.	Full compliance
Flood Plain Management (Executive Order 11988)	Full compliance
Protection of Wetlands (Executive Order 11990)	Full compliance
Farmland Protection Policy Act, 7 U.S.C. 4201, et seq.	Full compliance
Analysis of Impacts on Prime and Unique Farmland (CEQ Memorandum, 11 Aug 80)	Full compliance

NOTES:

a. Full compliance. Having met all requirements of the statute for the current stage of planning.
b. Partial compliance. Not having met some of the requirements that normally are met in the current stage of planning.
c. Noncompliance. Violation of a requirement of the statute.
d. Not applicable. No requirements for the statute required.

12. SUMMARY OF PROJECT ACCOMPLISHMENTS

The proposed project consists of constructing a perimeter water control dike, building a pump station and associated conveyance channels, planting warm season grasses and mast trees, and installing a fish egress structure.

Construction of a low-level perimeter dike will provide a reliable solution to frequent Illinois River stage fluctuations that historically have reduced moist soil food plant production. Construction of a pump station will enable water level manipulation capability that is crucial to the successful growth of moist soil/emergent vegetation and eventual use by migrating birds. Planting warm season grasses and mast-producing trees will enhance upland bird and animal use by providing cover, a variety of food sources, and habitat diversity. Installing a fish egress structure from Rice Lake to deep water areas in Duck Island's gravel pit will provide refuge for fish during summer drawdown periods and reduce avian botulism occurrences associated with fish kills.

The proposed enhancement features will provide increased management flexibility and the capability to optimize the quality and quantity of preferred habitats at this location. Implementation of the proposed project is projected to result in AAHU gains of 10,715.

13. OPERATIONS, MAINTENANCE, AND REHABILITATION CONSIDERATIONS

a. Project Data Summary. Table 13-1 presents a summary of project data.

b. Operation. Estimated annual operation costs are presented in Table 15-2.

c. Maintenance. The proposed features have been designed to ensure low annual maintenance requirements, with the estimated annual maintenance costs presented in Table 15-2. These quantities and costs may change during final design.

TABLE 13-1

Rice Lake Project Data Summary

Feature	Measurement	Unit of Measure
Water Control Dike		
Length	9,800	Feet
Elevation	442	Feet NGVD
Crown Width	10	Feet
Side Slopes	5:1	--
Overflow Structure		
Spillway Length	2,500	Feet
Spillway Elevation	440	Feet NGVD
Riprap	14,780	Ton
Bedding Stone	4,920	Ton
Gravity Drain Culverts		
Number	2	Each
Diameter	60	Inches
Length	1,200	Feet
Slide Gates	2	Each
Pump Station		
Riverside Structure Sill Elevation	421	Feet NGVD
Landside Structure Sill Elevation	421	Feet NGVD
Trash Rack	2	Each
Slide Gate	4	Each
Inlet Pipe		
Number	2	Each
Diameter	65	Inches
Length	400	Feet
Pump		
Number	3	Each
Flow	33,000	Gallon/Minute

TABLE 13-1 (Continued)

Feature	Measurement	Unit of Measure
Main Channel		
Length	16,700	Feet
Invert Elevation	430	NGVD
Channel Base Width	30	Feet
Side Slopes	3:1	Feet
Clearing/Grubbing	22	Acres
Excavation	222,000	Cubic Yards
Secondary Channel		
Length	6,000	Feet
Invert Elevation	433	NGVD
Channel Base Width	10	Feet
Side Slopes	3:1	Feet
Clearing/Grubbing	10	Acres
Excavation	30,000	Cubic Yards
Mast Trees Planting		
Pin Oak	712	Trees
Sycamore	712	Trees
Bur Oak	712	Trees
Northern Pecan	712	Trees
Swamp White Oak	712	Trees
Warm Season Grass Planting		
Surface Area	200	Acres
Fish Egress Structure		
Number	1	Each
Diameter	60	Inches
Length	1,200	Feet
Slide Gates	1	Each

14. PROJECT PERFORMANCE ASSESSMENT

This section summarizes the monitoring and data collection aspects of the project. The primary project objectives have been summarized elsewhere in this document, and the performance assessment is designed to gauge progress toward meeting these objectives.

Table 14-1 presents overall types, purposes, and responsibilities of monitoring and data collection.

Table 14-2 presents actual monitoring and data parameters grouped by project phase, as well as data collection intervals.

Table 14-3 presents the post-construction evaluation plan, which displays the specific parameters and the levels of enhancement that the project hopes to achieve.

TABLE 14-1

Monitoring and Performance Evaluation Matrix

Project Phase	Type of Activity	Purpose	Responsible Agency	Implementing Agency	Funding Source	Implementation Instructions
Pre-Project	Pre-Project Monitoring	Identify and define problems at HREP site. Establish need of proposed project features.	Sponsor	Sponsor	Sponsor	--
	Baseline Monitoring	Establish baselines for performance evaluation.	Corps	Field Station or Sponsor through Cooperative Agreements or Corps	HREP/-Sponsor	See Table 14-2.
Design	Data Collection for Design	Include quantification of project objectives, design of project, and development of performance evaluation plan.	Corps	Corps	HREP	See Table 14-2.
Construction	Construction Monitoring	Assess construction impacts; assures permit conditions are met.	Corps	Corps	HREP	See State Section 401 Stipulations
Post-Construction	Performance Evaluation Monitoring	Determine success of project as related to objectives.	Corps (quantitative) Sponsor (field observations)	Field Station or Sponsor through Cooperative Agreement, Sponsor thru O&M, or Corps	HREP/-Sponsor	See Table 14-3.
	Biological Response Monitoring	Evaluate predictions and assumptions of habitat unit analysis. Study beyond scope of performance evaluation.	Corps	Corps	HREP	--

TABLE 14-2

Resource Monitoring and Data Collection Summary [1]

Type Measurement	Water Quality Data: Pre-Project Phase, Apr-Sep	Water Quality Data: Pre-Project Phase, Oct-Mar	Water Quality Data: Design Phase, Apr-Sep	Water Quality Data: Design Phase, Oct-Mar	Water Quality Data: Post-Const. Phase, Apr-Sep	Water Quality Data: Post-Const. Phase, Oct-Mar	Engineering Data: Pre-Project Phase	Engineering Data: Design Phase	Engineering Data: Post-Const. Phase	Natural Resource Data: Pre-Project Phase	Natural Resource Data: Design Phase	Natural Resource Data: Post-Const. Phase	Sampling Agency	Remarks
POINT MEASUREMENTS														
Water Quality Stations [2]													Corps	
Turbidity			2W	M	2W	M								
Secchi Disk Transparency	2W		2W	M	2W	M								
Suspended Solids	2W		2W	M	2W	M								
Dissolved Oxygen	2W		2W	M	2W	M								
Specific Conductance	2W		2W	M	2W	M								
Water Temperature	2W		2W	M	2W	M								
pH	2W		2W	M	2W	M								
Total Alkalinity	--		2W	M	2W	M								
Chlorophyll	2W		2W	M	2W	M								
Velocity	--		2W	M	2W	M								
Water Depth	2W		2W	M	2W	M								
Water Elevation	2W		2W	M	2W	M								
Percent Ice Cover				M		M								
Ice Depth				M		M								
Percent Snow Cover				M		M								
Snow Depth				M		M								
Wind Direction			2W	M	2W	M								
Wind Velocity			2W	M	2W	M								
Wave Height			2W	M	2W	M								
Air Temperature			2W	M	2W	M								
Percent Cloud Cover			2W	M	2W	M								
Elutriate Test Stations			1											

TABLE 14-2 (Continued)

Resource Monitoring and Data Collection Summary [1/]

	Water Quality Data						Engineering Data			Natural Resource Data				
	Pre-Project Phase		Design Phase		Post-Const. Phase		Pre-Project Phase	Design Phase	Post-Const. Phase	Pre-Project Phase	Design Phase	Post-Const. Phase		
Type Measurement	Apr-Sep	Oct-Mar	Apr-Sep	Oct-Mar	Apr-Sep	Oct-Mar							Sampling Agency	Remarks
<u>POINT MEASUREMENTS</u> (con't.)														
<u>Column Settling Stations</u>														
Column Settling Analysis								1					Corps	
<u>Boring Stations</u> [3/]														
Geotechnical Borings								1					Corps	
<u>Fish Stations</u>														
Electrofishing										1	1	1	Illinois DNR	
<u>TRANSECT MEASUREMENTS</u>														
<u>Vegetation Transects</u>														
Mast Tree Survey												5Y	Corps	
<u>AREA MEASUREMENTS</u>														
<u>Mapping</u>														
Vegetation Mapping										1		5Y	Corps	
Aerial Photography/ Remote Sensing							1					5Y	Corps	

<u>Legend</u>

W = Weekly — nW = n-Week Interval
M = Monthly — nY = n-Year Interval
Y = Yearly — 1,2,3 = Number of times data is collected within designated project phase

TABLE 14-2 (Continued)

[1/] See plate 16 for active monitoring sites and transects.

[2/] Water Quality Station

W-I135.4B

[3/] Corps of Engineers Geotechnical Borings

Geotechnical Boring	Date	Geotechnical Boring	Date
RL-96-1	05-02-96	RL-96-17	04-26-96
RL-96-2	05-02-96	RL-96-18	04-26-96
RL-96-3	05-03-96	RL-96-19	05-22-96
RL-96-4	05-02-96	RL-96-20	05-22-96
RL-96-5	05-03-96	RL-96-21	05-22-96
RL-96-6	05-06-96	RL-96-22	05-22-96
RL-96-7	04-30-96	RL-96-23	05-22-96
RL-96-8	04-30-96	RL-96-24	05-01-96
RL-96-9	05-01-96	RL-96-25	04-30-96
RL-96-10	05-01-96	RL-96-26	04-25-96
RL-96-11	05-01-96	RL-96-27	04-25-96
RL-96-13	04-29-96	RL-96-28	05-25-96
RL-96-14	04-29-96	RL-96-29	04-24-96
RL-96-15	04-29-96	RL-96-34	04-04-96
RL-96-16	04-29-96	RL-96-35	04-25-96

TABLE 14-3

Post-Construction Evaluation Plan

Goal	Objective	Enhancement Features	Unit	Year 0 Without Alternative	Year 0 With Alternative	Year X With Alternative [1]	Year 50 Target With Alternative	Feature Measurement Ref. Table 14-2	Annual Field Observations by Site Manager
				Enhancement Potential					
Enhance Wetland Habitat	Increase rate of success of emergent/moist soil vegetation Increase food and shelter for wetland wildlife	Reestablish Hate Levee with water control structure, including water control dike added between Hate Levee and access road, and construct pump station with conveyance ditches	Probability of successful operation (percent)	18	29	29	29	Observation of Manager on whether the site achieved drawdown and flooding at desired time.	Record observations for both drawdown and flooding. Inspect and record conveyance ditches condition.
Enhance Aquatic Habitat	Increase fish egress from Rice Lake during drawdown	Acquire Duck Island and provide gated structure	Fish movement from Rice Lake to Gravel Pit	0	[2]			Outlet side fish egress structure net sampling.	Record observations on fish kills, avian botulism cases.
Enhance Terrestrial Habitat	Increase food and cover for terrestrial wildlife	Establish mast tree plantings on Duck Island	Survival (percent)	0	100	80	65	Tree count/random sampling	Estimate effective acreage and wildlife use.
		Establish warm season grass plantings on Duck Island	Acre	0	0	200	200	Vegetation transects	Estimate area of established/ regenerated vegetation.

[1] The year of monitoring varies with purpose and nature of goal and feature.

[2] To be determined post construction.

15. COST ESTIMATES

A detailed estimate of project design and construction costs is presented in Table 15-1. A discussion of the basis for project element and contingency costs is presented in Appendix J. A detailed estimate of operation, maintenance, and rehabilitation costs is presented in Table 15-2. Table 15-3 presents the estimated annual monitoring costs as described in Section 14. Quantities may vary during final design.

TABLE 15-1

RICE LAKE STATE FISH
AND WILDLIFE AREA
HABITAT REHABILITATION
AND ENHANCEMENT
PROJECT COST ESTIMATE
DECEMBER 1996

ACCOUNT	FEATURE	CURRENT WORKING ESTIMATE (CWE)	[2] FULLY FUNDED ESTIMATE (FFE)
	RICE LAKE EMP PHASE ONE		
01	LANDS AND DAMAGES	$ -	$ -
O6.	FISH AND WILDLIFE FACILITIES	$ 1,618,836	$ 1,853,082
30.	PLANNING, ENGINEERING AND DESIGN	$ 458,380	$ 527,320
31.	CONSTRUCTION MANAGEMENT	$ 70,190	$ 80,747
	PROJECT COSTS SUBJECT TO COST SHARING[1]	$ 2,147,406	$ 2,461,148
	NON-FEDERAL COSTS	$ 536,852	$ 614,534
	NON-FEDERAL LANDS & DAMAGES	$ -	$ -
	REQUIRED NON-FEDERAL CASH CONTRIBUTION[3]	$ 536,852	$ 614,534
	FEDERAL COST	$ 1,610,555	$ 1,846,615
	GENERAL DESIGN, DEFINITE PROJECT REPORT	$ (325,500)	$ (374,455)
	PHASE I REMAINING FEDERAL COSTS	$ 1,285,055	$ 1,472,159
	RICE LAKE EMP PHASE TWO		
01	LANDS AND DAMAGES	$ 1,456,900	$ 1,456,900
O6.	FISH AND WILDLIFE FACILITIES	$ 2,921,790	$ 3,344,573
30.	PLANNING, ENGINEERING AND DESIGN	$ 305,250	$ 351,160
31.	CONSTRUCTION MANAGEMENT	$ 323,940	$ 372,661
	PROJECT COSTS SUBJECT TO COST SHARING[1]	$ 5,007,880	$ 5,525,293
	NON-FEDERAL COSTS	$ 1,251,970	$ 1,381,323
	NON-FEDERAL LANDS & DAMAGES	$ (1,456,900)	$ (1,456,900)
	REQUIRED NON-FEDERAL CASH CONTRIBUTION	$ -	$ -
	FEDERAL COST	$ 3,550,980	$ 4,068,393
	GENERAL DESIGN, DEFINITE PROJECT REPORT	$ -	$ -
	PHASE II REMAINING FEDERAL COSTS	$ 3,550,980	$ 4,068,393
	TOTAL REMAINING FEDERAL COSTS	4,836,035	$ 5,540,553

NOTES:

1. STATE LANDS.
2. CONSTRUCTION SCHEDULED FOR AUGUST 00 - SEPTEMBER 02. FULLY FUNDED ESTIMATE (FFE) IS BASED ON MIDPOINT OF CONSTRUCTION OF SEPTEMBER 2002, RESULTING IN INFLATION FACTORS OF 1.1504 FOR SALARIES AND 1.1447 FOR ALL OTHER COSTS PER CECW-B MEMO, 25 JAN 93, SUBJECT: FACTORS FOR UPDATING STUDY/PROJECT COST ESTIMATES FOR THE FY 1995 BUDGET SUBMISSION.
3. NOT REQUIRED IF BOTH PHASES ARE COMPLETED UNDER INITIAL PROJECT.

TABLE 15-1 (Continued)

Acct Code	Item	Quantity	Unit	Unit Price	Amount	Contingency	Con %
	PHASE I WORK						
06.	**FISH AND WILDLIFE FACILITIES**						
06.	**DEFLECTION DIKE**						
06.	STRIPPING	8,100	CY	$ 1.50	$ 12,150	$ 2,430	20.0%
06.	CLEARING AND GRUBBING	10	Acres	$ 2,700.00	$ 27,000	$ 5,400	20.0%
06.	EMBANKMENT FILL	44,000	CY	$ 2.50	$ 110,000	$ 22,000	20.0%
06.	SEEDING	10	Acres	$ 2,000.00	$ 20,000	$ 4,000	20.0%
		TOTAL			$ 169,150	$ 33,830	
06.	**OVERFLOW STRUCTURE**						
06.	RIPRAP	18,650	TON	$ 35.00	$ 652,750	$ 130,550	20.0%
06.	BEDDING	6,208	TON	$ 35.00	$ 217,280	$ 43,456	20.0%
		TOTAL			$ 870,030	$ 174,006	
06.	**CULVERT (GRAVITY)**						
06.	CLEARING AND GRUBBING	1.5	ACRE	$ 2,700.00	$ 4,050	$ 810	20.0%
06.	EXCAVATING	3,000	CY	$ 3.00	$ 9,000	$ 1,800	20.0%
06.	CMP	2,000	LF	$ 144.00	$ 288,000	$ 57,600	20.0%
06.	SLIDE GATE	2	EA	$ 4,400.00	$ 8,800	$ 1,760	20.0%
			TOTAL		$ 309,850	$ 61,970	
			TOTAL		$ 1,349,030	$ 269,806	
06.	**FISH AND WILDLIFE FACILITIES TOTAL COST**				$ 1,618,836		
30.	**PLANNING, ENGINEERING, AND DESIGN**						
	DEFINITE PROJECT REPORT				$ 310,000	$ 15,500	5.0%
	PLANS AND SPECIFICATIONS						
	PHASE 1				$ 93,200	$ 9,320	10.0%
	ENGINEERING DURING CONSTRUCTION						
	PHASE 1				$ 25,300	$ 5,060	20.0%
			TOTAL		$ 428,500	$ 29,880	
30.	**PLANNING, ENGINEERING, AND DESIGN TOTAL COST**				$ 458,380		
31.	**CONSTRUCTION MANAGEMENT**						
	CONSTRUCTION ADMINISTRATION						
	PHASE 1				$ 7,500	$ 1,500	20.0%
	REVIEW OF SHOP DRAWINGS						
	PHASE 1				$ 6,100	$ 610	10.0%
	INSPECTION AND QUALITY ASSURANCE						
	PHASE 1				$ 45,400	$ 9,080	20.0%
			TOTAL		$ 59,000	$ 11,190	
31.	**CONSTRUCTION MANAGEMENT TOTAL COST**				$ 70,190		

TABLE 15-1 (Continued)

PHASE II WORK

01.	**LANDS AND DAMAGES**										
01.	Real Estate	1	LS			$	1,456,900.00	$	-	0%
06.	**MAIN CHANNEL DREDGING**									
06.	CLEARING AND GRUBBING	22	ACRE	$	2,700.00	$	59,400	$	11,880	20.0%
06.	EXCAVATING	222,000	CY	$	3.00	$	666,000	$	133,200	20.0%
06.	SEEDING	22	ACRE	$	2,000.00	$	44,000	$	8,800	20.0%
			TOTAL			$	769,400	$	153,880	
06.	**PUMP STATION**									
06.	DEWATERING	1	JOB		SUM	$	40,000	$	8,000	20.0%
06.	SHEETPILING	100	TON	$	980.00	$	98,000	$	19,600	20.0%
06.	STRUCTURAL EXCAVATION	500	CY	$	8.00	$	4,000	$	800	20.0%
06.	STRUCTURAL CONCRETE	595	CY	$	75.00	$	44,625	$	8,925	20.0%
06.	BUILDING APPURTENANCES	1	JOB		SUM	$	60,000	$	12,000	20.0%
06.	SLIDE GATE	4	EA	$	6,000.00	$	24,000	$	4,800	20.0%
06.	TRASH RACK ASSEMBLIES	18,000	LB	$	2.50	$	45,000	$	9,000	20.0%
06.	INTAKE PIPE (2-65")	800	FT	$	175.00	$	140,000	$	28,000	20.0%
06.	MISC. ELECTRICAL WORK	1	JOB		SUM	$	100,000	$	20,000	20.0%
06.	PUMP	3	EA	$	45,000.00	$	135,000	$	27,000	20.0%
06.	CLEARING AND GRUBBING	20	ACRE	$	2,700.00	$	54,000	$	10,800	20.0%
			TOTAL			$	744,625	$	148,925	
06.	**SECONDARY CHANNEL DREDGING**									
06.	CLEARING AND GRUBBING	10	ACRE	$	2,700.00	$	25,650	$	5,130	20.0%
06.	EXCAVATING	30,000	CY	$	3.00	$	90,000	$	18,000	20.0%
06.	SEEDING	10	ACRE	$	2,000.00	$	20,000	$	4,000	20.0%
			TOTAL			$	135,650	$	27,130	
06.	**UPLAND FOREST/GRASSLAND**									
06.	GRASSLAND PLANTING	200	ACRE	$	2,000.00	$	400,000	$	80,000	20.0%
06.	MAST TREE PLANTING	100	ACRE	$	2,000.00	$	200,000	$	40,000	20.0%
			TOTAL			$	600,000	$	120,000	
06.	**FISH PASSAGE CULVERT**									
06.	CLEARING AND GRUBBING	0.5	ACRE	$	2,700.00	$	1,350	$	270	20.0%
06.	EXCAVATING	2,200	CY	$	3.00	$	6,600	$	1,320	20.0%
06.	CMP	1,200	LF	$	144.00	$	172,800	$	34,560	20.0%
06.	SLIDE GATE	1	EA	$	4,400.00	$	4,400	$	880	20.0%
			TOTAL			$	185,150	$	37,030	
			TOTAL			$	2,434,825	$	486,965	
06.	**FISH AND WILDLIFE FACILITIES**		**TOTAL COST**			$	2,921,790			

TABLE 15-1 (Continued)

30.	**PLANNING, ENGINEERING, AND DESIGN**					
	PLANS AND SPECIFICATIONS					
	PHASE 2	$	197,100	$	19,710	10.0%
	ENGINEERING DURING CONSTRUCTION					
	PHASE 2	$	73,700	$	14,740	20.0%
	TOTAL	$	270,800	$	34,450	
30.	**PLANNING, ENGINEERING, AND DESIGN TOTAL COST**	$	305,250			
31.	**CONSTRUCTION MANAGEMENT**					
	CONSTRUCTION ADMINISTRATION					
	PHASE 2	$	35,000	$	7,000	20.0%
	REVIEW OF SHOP DRAWINGS					
	PHASE 2	$	28,200	$	2,820	10.0%
	INSPECTION AND QUALITY ASSURANCE					
	PHASE 2	$	209,100	$	41,820	20.0%
	TOTAL	$	272,300	$	51,640	
31.	**CONSTRUCTION MANAGEMENT TOTAL COST**	$	323,940			

TABLE 15-2

Estimated Annual Operation and Maintenance Costs (February 1997 Price Level)

	Quantity	Unit	Unit Price ($)	Total Cost ($)
Operation				
Pump Station				8,000
Maintenance				
Inspection	40	Hours	25.00	1,000
Debris Removal (channel/culverts)	40	Hours	50.00	2,000
Apply Herbicide (if necessary - first two years) [1/]	3,560	Tree	0.49	1,740
Subtotal Maintenance:				4,740
Rehabilitation [2/]				
			Subtotal:	12,740
Contingencies (20%)				2,550
			TOTAL:	15,290

[1/] Annualized cost for herbicide application is based on a present worth cost of $3.09/tree. Interest rate = 7-3/4%.

[2/] Rehabilitation work cannot be accurately estimated. Rehabilitation is reconstructive work that significantly exceeds the annual operation and maintenance requirements identified above and that is needed as the result of major storm events.

TABLE 15-3

Estimated Post-Construction Annual Monitoring Costs ($) (February 1997 Price Level)

Item	Annual Cost ($)
Engineering Data [1]	3,000
Natural Resource Data [1]	2,000
Subtotal	5,000
Contingencies (20%)	1,000
Subtotal	6,000
Planning, Engineering, Design [2]	1,500
Total	7,500

[1] Reference Tables 14-2 and 14-3.
[2] Includes cost of annual evaluation report.

16. REAL ESTATE REQUIREMENTS

The Rice Lake, Illinois, Habitat Rehabilitation and Enhancement project, is a part of the Upper Mississippi River System - Environmental Management Program, authorized by Section 1103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended. The project is located on the right bank of the Illinois River, approximately 24 miles southwest of Peoria, Illinois, in Fulton County.

The project, which will be cost-shared by the Illinois Department of Natural Resources, as the local sponsor, will include the Rice Lake State Fish and Wildlife Area, as well as a portion of Duck Island, which is privately owned.

The Rice Lake State Fish and Wildlife Area encompasses 5,660 acres owned in fee by the State of Illinois. Originally, the area was designated a refuge for migratory waterfowl, with a portion available for hunting. Subsequent land acquisition included areas for camping, as well as mid-migration habitat. Since the area is subject to extensive flooding, water management projects have been established to provide water control. Each year the lake is drawn down and aerially seeded with high quality moist soil plants to provide food to attract migrating waterfowl.

Duck Island encompasses approximately 1,157 acres of land that extends into the Rice Lake State Fish and Wildlife Area. Approximately 617 acres of the island, which is privately owned, will be acquired in fee title by the State of Illinois Department of Natural Resources as a part of the project. The majority of the island is used for agricultural purposes; however, both hunting (recreation) and mining operations are also actively pursued.

The project area is not within the navigational servitude, nor does it include any Federal lands.

Borrow material will be obtained from within the project area on lands owned in fee by the State of Illinois.

Access to the Rice Lake State Fish and Wildlife Area is by public highway; however, access to Duck Island is by private road. Approximately 32 acres of land will be acquired in permanent easement for access to those portions of the island being acquired for the project. The access acquisition is included in the cost estimate.

The following relocations, pursuant to Public Law 91-646, are possible with the acquisition of Duck Island:

a. A tenant farmer, on a yearly lease for a percentage share of the net crop sales, farms approximately 527 acres of corn and beans. The tenant farmer also uses a machine shed on the property to store agricultural equipment.

b. A lessee of the northern lands of Duck Island for hunting purposes also may be affected. The 3-year lease expires at the end of the 1997 waterfowl season. The lessee owns and maintains a small, minimally constructed hunting shack on the island. The owner intends to re-lease the hunting rights if the terms are acceptable.

The checklist for assessment of the local sponsor's land acquisition experience and ability to acquire is included as Exhibit 1 of Appendix C.

A cost estimate for the real estate and associated activities is included as Table 16-1 of this section. A map showing the project area is included as Exhibit 2 of Appendix C.

The mining activity on Duck Island has been seasonal and is subject to closure during high water. The minerals that are being extracted are of average quality and when processed correctly meet the Illinois Department of Transportation standards. The projected supply of aggregate material varies (based upon the person asked) from approximately 6,400 tons per acre to 9,000 tons per acre, with approximately 375 acres estimated for potential mining. Since only a portion of the island will be acquired and used as part of Rice Lake State Fish and Wildlife Area, continued mining of the area should not be affected.

There are no known hazardous, toxic, or radioactive sites within the project area.

There are no utilities or facilities that have been identified as needing to be relocated.

The anticipated acquisition will include both fee simple and permanent road easement. There are no proposed non-standard estates.

The State of Illinois, Department of Natural Resources, as the local sponsor, will be required to enter into a Project Cooperation Agreement (Appendix C), which includes the following responsibilities:

a. Provide all lands, easements, rights-of-way, relocations, and suitable borrow and disposal sites (LERRD).

b. Provide an additional cash contribution to equal 25 percent of total project costs, if the creditable portion of LERRD is less than 25 percent of total project costs.

c. Operate, maintain, repair, or replace the project, at no cost to the Government, in a manner compatible with the project's authorized purpose, in accordance with applicable Federal and State laws, and in accordance with specific directions prescribed by the Government.

d. Save and hold the Government free from all damages arising from the construction, operation, maintenance, and repair of the project, except for damages due to the fault or negligence of the Government or its contractors.

Lands acquired for project purposes, after execution of the Project Cooperation Agreement, may be eligible for credit against the local sponsor's 25 percent requirement. Lands already owned as a part of the Rice Lake State Fish and Wildlife Area are not creditable.

TABLE 16-1

Cost Estimate for Real Estate and Associated Activities

		Non-Federal	Federal	Contingency	Percent	Total
Land		$1,040,240	$0	$259,760	25	$1,300,000
Acquisition		$12,500	$6,250	$3,750	20	$22,500
Appraisal		$15,000	$4,000	$3,800	20	$22,800
Relocations						
	Farming	$40,000	$8,000	$9,600	20	$57,600
	Hunting	$15,500	$8,000	$4,700	20	$28,200
PCA		$0	$10,000	$2,000	20	$12,000
Credits		$2,500	$9,000	$2,300	20	$13,800
Total		$1,125,740	$45,250	$285,910		$1,456,900

17. SCHEDULE FOR DESIGN AND CONSTRUCTION

Table 17-1 presents the schedule of project completion steps.

TABLE 17-1

Project Implementation Schedule

Requirement	**Scheduled Date**
Submission of Draft DPR for review to Corps of Engineers Mississippi Valley Division	Sep 97
Distribution of DPR for public and agency review	Jan 98
Submission of final and public reviewed DPR to Mississippi Valley Division	May 98
Receive plans and specifications funds	Aug 98
Construction approval by Assistant Secretary of the Army (Civil Works)	Jan 99
Submission of final plans and specifications for Internal Technical Review and approval by Mississippi Valley Division	Jun 99
Obtain approval of plans and specifications	Jun 99
Execution of Project Cooperation Agreement	Jul 99
Advertise contract	Aug 99
Award contract	Nov 99
Complete construction	Aug 01

18. IMPLEMENTATION RESPONSIBILITIES AND VIEWS

a. Corps of Engineers. The Corps of Engineers, Rock Island District, is responsible for project management and coordination with the USFWS, the State of Illinois, and other affected agencies. The Rock Island District will submit the subject definite project report; program funds; finalize plans and specifications; complete all NEPA requirements; advertise and award a construction contract; and perform construction contract supervision and administration.

b. U.S. Fish and Wildlife Service. The USFWS will produce a Coordination Act Report (CAR) for this project. In addition, the USFWS should ensure that all proposed enhancement features are compatible with regional refuge objectives and management strategies.

c. Illinois Department of Natural Resources. The Illinois DNR, as the non-Federal project sponsor, will be required to provide all lands, easements, rights-of-way, relocations, and borrow and disposal sites. In addition, a cash contribution is needed if the creditable cost of the aforementioned real estate actions is less than 25 percent of total project costs. Operation and maintenance of the project, as described in Table 15-2, is also the responsibility of the Illinois DNR in accordance with Section 107(b) of the Water Resources Development Act of 1992, Public Law 102-580. These functions will be further specified in the Project Operation and Maintenance Manual to be provided by the U.S. Army Corps of Engineers prior to final acceptance of the project by the sponsor.

19. COORDINATION, PUBLIC VIEWS, AND COMMENTS

Coordination has been made throughout the planning and design process with the following State and Federal agencies:

Illinois Department of Agriculture
Illinois Department of Natural Resources
Illinois Historic Preservation Agency
Illinois Department of Transportation
Natural Resources Conservation Service
U.S. Fish and Wildlife Service
U.S. Environmental Protection Agency

a. Coordination Meetings. Ongoing coordination between the Corps, the U.S. Fish and Wildlife Service, and the Illinois Department of Natural Resources was demonstrated by the following meetings:

(1) November 30, 1987. Plan formulation meeting with the Corps, the Illinois DNR, and the USFWS.

(2) June 19, 1995. Corps in-house meeting; general project discussion.

(3) June 22, 1995. General project discussion with the Corps and the Illinois DNR.

(4) January 23, 1996. General coordination meeting with the Corps and the Illinois DNR.

(5) February 5, 1996. General project discussion with the Corps and the Illinois DNR.

b. Coordination by Correspondence. The following letters are contained in Appendix A - Correspondence:

(1) Letter dated September 9, 1996, from the Rock Island District to project proponents and other reviewing agencies requesting preliminary comments concerning the proposed project.

(2) Letter dated September 10, 1996, from the Rock Island District to the Illinois Department of Natural Resources providing Scope of Work for Phase I Intensive Archeological Survey for Historic Properties.

(3) Letter dated September 10, 1996, from the Rock Island District to the Illinois Historic Preservation Agency providing a Scope of Work for Phase I Intensive Archeological Survey for Historic Properties.

(4) Letter dated October 11, 1996, from the Rock Island District to the Natural Resource Conservation Service requesting determination of whether the proposed project site contains farmland subject to the provisions of the Farmland Protection Policy Act of 1981.

(5) Farmland Conversion Impact Rating, dated November 5, 1996, prepared by the Natural Resources Conservation Service for the proposed project site.

(6) Letter dated November 29, 1996, from the Rock Island District to Illinois Department of Natural Resources forwarding results of the project's archeological investigation.

(7) Letter dated November 29, 1996, from the Rock Island District to the Illinois Historic Preservation Agency forwarding results of the project's archeological investigation.

(8) Letter dated December 6, 1996, from the Illinois Historic Preservation Agency stating compliance of the proposed project with Section 106 of the National Historic Preservation Act of 1966.

(9) Letter dated December 16, 1996, from the Rock Island District to the Illinois State Museum concurring with the recommendations in the draft report on Phase I Intensive Archaeological Survey for Historic Properties.

(10) Letter dated February 5, 1997, from the Rock Island District to the Illinois Historic Preservation Agency forwarding the draft report on Phase I Intensive Archaeological Survey for Historic Properties.

(11) Draft Fish and Wildlife Coordination Act (FWCA) report, dated February 24, 1997, from the U.S. Fish and Wildlife Service, Rock Island Field Office.

20. CONCLUSIONS

The habitat value of the Rice Lake State Fish and Wildlife Area is not being fully realized due to frequent summer/fall flooding events that reduce food production and subsequent use by migrating birds.

The recommended project features (perimeter water control dike, pump station and conveyance channels, a fish egress structure, and warm season grass and mast tree plantings) are designed to meet the project's goal of enhancing wetland, terrestrial, and aquatic habitat by increasing the success ratio of moist soil/emergent vegetation, improving fish egress from Rice Lake during drawdown conditions, and increasing food, shelter, and cover for migrating birds, terrestrial birds, mammals, and other wildlife.

Assessment of the future with-project scenario shows definite increases in total habitat units over the 50-year project life for the target species, as well as a majority of other wetland-dwelling species considered. These increases represent quantification of the projected outputs—improved habitat quality and increased preferred habitat quantity.

This project is consistent with and fully supports the overall goal and objectives of the UMRS-EMP, the North American Waterfowl Management Plan, and the Partners in Flight program.

21. RECOMMENDATIONS

I have weighed the outputs to be obtained from the full implementation of this habitat rehabilitation and enhancement project against its estimated cost and have considered the various alternatives proposed, impacts identified, and overall scope. In my judgment, this project, as proposed, justifies expenditure of Federal funds. I recommend that the Secretary of the Army for Civil Works approve the proposed project to include constructing a perimeter water control dike with spillway and gated outlet structures, constructing a 100,000 gpm pump station and conveyance ditches, planting 200 acres of warm season grasses and 100 acres of mast trees, and installing a gated 60-inch fish egress structure.

The current estimated Federal construction cost of this project is $1,285,055 for Phase I and $3,550,980 for Phase II. Total Federal estimated project cost, including general design, is $5,161,535.

This project will be constructed on State-owned lands and will require cost sharing of the project general design cost (75 percent Federal/25 percent non-Federal) with the non-Federal sponsor, the Illinois Department of Natural Resources. The total non-Federal cost share is estimated at $536,852 for Phase I work or $1,456,900 if both Phases I and II are completed under the initial project.

At this time, I further recommend that funds in the amount of $164,000 be allocated for the preparation of the project plans and specifications.

James V. Mudd
Colonel, U.S. Army
District Engineer

22. FINDING OF NO SIGNIFICANT IMPACT

I have reviewed the information provided by this Environmental Assessment, along with data obtained from Federal and State agencies having jurisdiction by law or special expertise, and from the interested public. I find that the proposed habitat enhancement project at the Rice Lake SFWA would not significantly affect the quality of the human environment. Therefore, it is my determination that an Environmental Impact Statement is not required. This determination may be reevaluated if warranted by further developments.

An array of management features and alternatives were considered for habitat enhancement. Features considered were:

a. No Federal Action

b. Perimeter Water Control Dike

c. Water Level Management Capability

d. Grassland/Mast Tree Planting

e. Fish Egress Structure

The preferred alternative consists of: constructing a perimeter water control dike with a top elevation of 442 with a spillway elevation of 440 and two gated outlet structures; constructing a new pump station and associated conveyance ditches to manage water levels on Big Lake and Rice Lake; converting a portion of cropland on Duck Island to grassland and forest habitat by planting 200 acres to warm season grasses and 100 acres to mast-producing tree species; and constructing a fish passage structure between Rice Lake and the Duck Island gravel pit.

Factors considered in making a determination that an Environmental Impact Statement was not required were as follows:

a. The project is anticipated to improve the value of the Rice Lake area for migratory and resident birds, fish, and wildlife species.

b. Aside from temporary disturbance during construction periods, no long-term adverse effects to natural or cultural resources are anticipated. No State or Federal endangered or threatened species would be affected by the proposed action.

c. The project is in compliance with Sections 401 and 404 of the Clean Water Act.

d. No significant economic impacts are expected to occur in the project area.

____

(Date)

James V. Mudd
Colonel, U.S. Army
District Engineer

CORRESPONDENCE

APPENDIX A

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17D)

RICE LAKE STATE FISH AND WILDLIFE AREA
HABITAT REHABILITATION AND ENHANCEMENT

LA GRANGE POOL, ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

APPENDIX A
CORRESPONDENCE

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DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF:

September 9, 1996

Planning Division

SEE DISTRIBUTION LIST

The Rock Island District of the U.S. Army Corps of Engineers (Corps) is currently preparing a Definite Project Report (DPR) with Environmental Assessment (EA) for the rehabilitation of Rice Lake State Fish and Wildlife Area (SFWA), Illinois. Rice Lake has been funded for design as a Habitat Rehabilitation and Enhancement Project of the Upper Mississippi River System - Environmental Management Program under authority of the Water Resources Development Act of 1986. In accordance with the provisions of Section 906(e) of the Water Resources Development Act of 1986 (Public Law 99-662), cost sharing for general design and construction would be 75 percent Federal/25 percent non-Federal. The non-Federal sponsor for this project would be the Illinois Department of Natural Resources (ILDNR).

The Rice Lake SFWA is a 5,592-acre complex of natural backwater lakes and wetlands located on the right descending bank of the Illinois River between River Mile 132 and 138, in Fulton County, Illinois (see enclosed location map). The project area is owned by the State of Illinois and is managed as a conservation area. The historically excellent mid-migration waterfowl and aquatic habitat has declined in recent years as a result of sedimentation.

The overall goal of the Habitat Rehabilitation and Enhancement Project for the Rice Lake SFWA is the restoration of wetland habitat. The following objectives have been identified to meet the restoration goal: (1) increase the rate of success of submergent/emergent aquatic vegetation; (2) increase food and shelter for wildlife; (3) provide egress for fish from Rice Lake during drawdown periods; and (4) improve bottomland hardwood and native cool season grass diversity and quality. Several rehabilitation measures to meet the identified objectives will be addressed and evaluated in the DPR and EA. These measures are shown on the enclosed preliminary plan and described in the following paragraphs:

a. Reestablishment of the existing Hate Levee at the downstream end of the project area and construction of a low level deflection dike along the riverward perimeter of the project area. This measure would increase the rate of success of submergent/emergent vegetation and provide more reliable food production for migratory birds.

b. Excavation of channels, construction of low level dikes, construction of a pump station, and construction of an outlet structure in the northeastern portion of the project area currently managed for production of moist soil vegetation. These measures would increase the ability to manage water levels in the area and improve habitat for herons, egrets, and shorebirds at critical times during the year.

c. Construction of gated culverts for fish egress from Rice Lake. This measure would increase the availability of deepwater habitat to fish in the project area and reduce fish kills related to the drawdown of Rice Lake, thereby reducing the occurrence of avian botulism which has been a serious problem in Rice Lake. Implementation of this measure and the measure described in paragraph (d) below would require the ILDNR to purchase lands or easements on Duck Island, a private inholding within the SFWA.

d. Planting mast producing trees such as pin oak, bur oak, swamp white oak, pecan, and sycamore, and cool season grasses on Duck Island. This measure would improve habitat value for wildlife by increasing the occurrence of mast-producing trees in the project area which is currently dominated by silver maple and cottonwood.

The overall effect of the project is expected to be beneficial to wetland habitat with no significant adverse impacts to the quality of the human environment. While construction of project features will initially affect some existing habitat within the project area, anticipated increases in habitat values throughout the area should offset any negative impacts. The proposed project will be compatible with the Natural Resources Management Plan developed by the ILDNR for the Rice Lake SFWA. Because several of the potential project features would require placement of fill material into waters of the U.S., the project will require processing under Section 404 of the Clean Water Act.

We request your preliminary comments concerning the proposed project within 30 days of the date of this letter. Additional opportunities to comment will be provided as part of our processing of the draft and public review DPR's for the subject project. Distribution of these documents is currently scheduled for November 1996 and February 1997, respectively.

If you have any questions or need additional information, please call Ms. Charlene Carmack of our Environmental Analysis Branch, telephone 309/794-5570. Written comments may be sent to our address above, ATTN: Planning Division (Charlene Carmack).

Sincerely,

Dudley M. Hanson, P.E.
Chief, Planning Division

Enclosures

Copies Furnished:

Mr. Bill Douglass
Illinois Department of Natural Resources
Rice Lake State Fish and Wildlife Area
R.R. 3, Box 91
Canton, Illinois 61520 (w/enclosures)

Mr. Marvin Hubbell
Illinois Department of Natural Resources
524 South Second Street
Third Floor, Room 310
Springfield, Illinois 62706 (w/enclosures)

DISTRIBUTION LIST

Mr. Richard Nelson
U.S. Fish and Wildlife Service
4469 48th Avenue Court
Rock Island, Illinois 61201

Mr. Harlan Hirt
U.S. Environmental Protection Agency
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

Mr. Tom Beissel
Illinois Department of Natural Resources
2612 Locust Street
Sterling, Illinois 61081

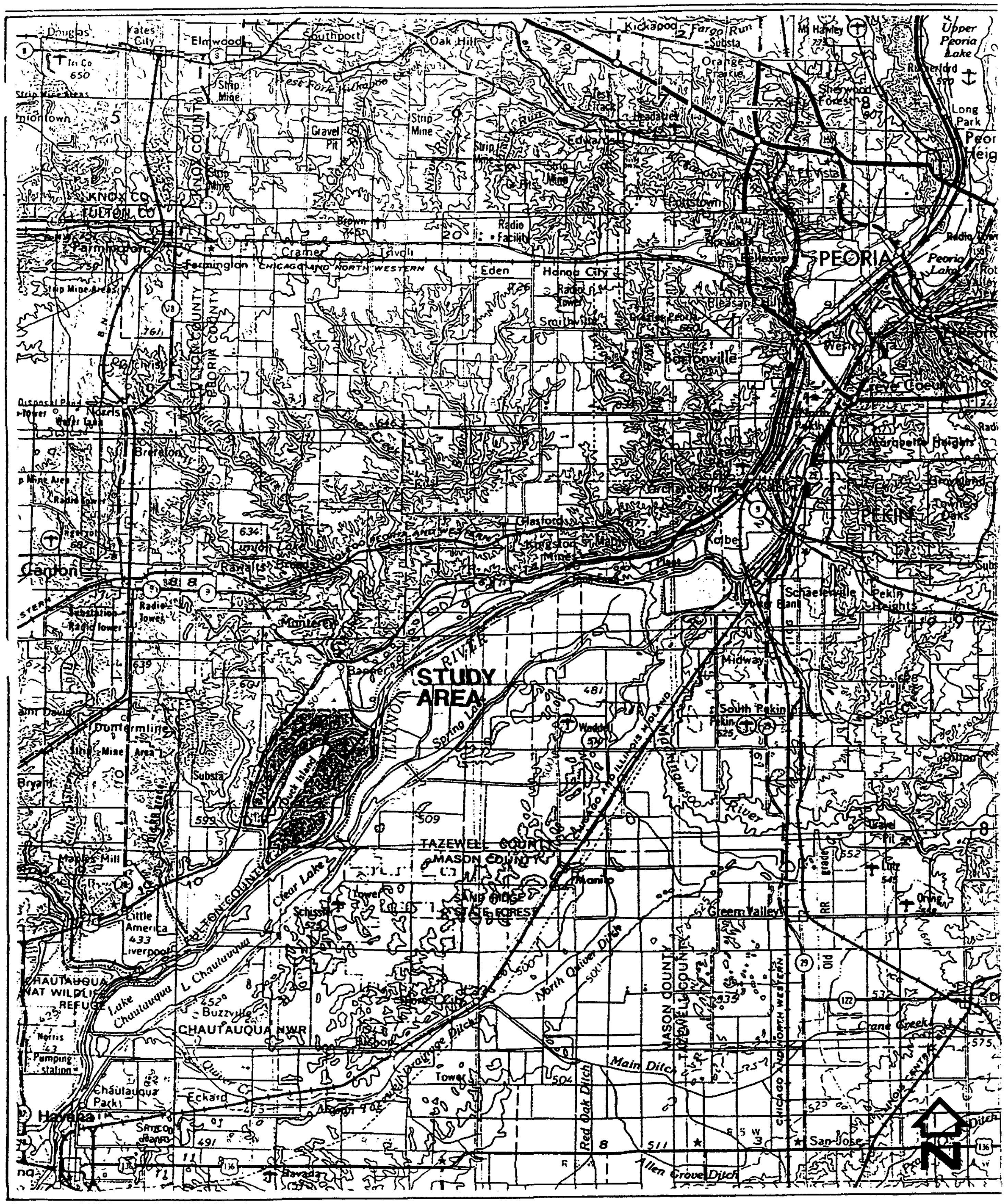
Mr. Norman Emerick
Illinois Department of Natural Resources
2100 South Lake Story Road
Galesburg, Illinois 61401

Mr. Rob Hilsabeck
Illinois Department of Natural Resources
215 North Fifth Street, Suite D
Pekin, Illinois 61554

Mr. K. Douglas Blodgett
Illinois Natural History Survey
LTRM Field Station
704 North Schrader Avenue
Havana, Illinois 62644

Mr. Bruce Yurdin
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 63101

Mr. Dennis Kennedy
Senior Water Resources Engineer
Illinois Department of Natural Resources
Office of Water Resources
3215 Executive Park Drive
P.O. Box 19484
Springfield, Illinois 62794



LOCATION MAP

Enclosure 1

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF:

September 10, 1996

Planning Division (1165-2-26a)

Mr. Harold Hassen
Illinois Department
of Conservation
Lincoln Tower Plaza, Room 310
524 South Second Street
Springfield, Illinois 62701-1787

Dear Mr. Hassen:

The Rock Island District of the U.S. Army Corps of Engineers (Corps) has enclosed the Scope of Work (SOW) for a Phase I Intensive Archeological Survey for Historic Properties for the Rice Lake Complex Habitat Rehabilitation and Enhancement Project (HREP). The HREP is a part of the Upper Mississippi River System - Environmental Management Program (UMRS-EMP).

The SOW was awarded to Illinois State Museum, Springfield, Illinois. The SOW may be useful in your department's review and comment on our reports, necessary in meeting our requirements promulgated under Section 106 of the National Historic Preservation Act of 1966, as amended.

If you should have questions concerning the Rice Lake Complex HREP or the Phase I archeological survey and contract, please call Mr. Ron Deiss of our Environmental Analysis Branch, telephone 309/795-5185, or write to our address above, ATTN: Planning Division (Ron Deiss).

Sincerely,

ORIGINAL SIGNED BY
F. BURKE
Dudley M. Hanson, P.E.
Chief, Planning Division

Enclosure

Copies Furnished:

Ms. Anne Haaker
Deputy State Historic
  Preservation Officer
Illinois Historic
  Preservation Agency
Old State Capitol
Springfield, Illinois 62704 (wo/enclosure)

Mr. Michael Wiant
Illinois State Museum
Research and Collections Lab
1920 South 10 1/2 Street
Springfield, Illinois 62703 (wo/enclosure)

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF:

September 10, 1996

Planning Division (1165-2-26a)

Ms. Anne Haaker
Deputy State Historic
Preservation Officer
Illinois Historic
Preservation Agency
Old State Capitol
Springfield, Illinois 62704

Dear Ms. Haaker:

The Rock Island District of the U.S. Army Corps of Engineers (Corps) has enclosed the Scope of Work (SOW) for a Phase I Intensive Archeological Survey for Historic Properties for the Rice Lake Complex Habitat Rehabilitation and Enhancement Project (HREP). The HREP is a part of the Upper Mississippi River System - Environmental Management Program (UMRS-EMP).

The SOW was awarded to Illinois State Museum, Springfield, Illinois. The SOW may be useful in your agency's review and comment on our reports and in meeting our requirements promulgated under Section 106 of the National Historic Preservation Act of 1966, as amended.

If you should have questions concerning the Rice Lake Complex HREP or the Corps' Phase I archeological survey and contract, please call Mr. Ron Deiss of our Environmental Analysis Branch, telephone 309/795-5185, or write to our address above, ATTN: Planning Division (Ron Deiss).

Sincerely,

ORIGINAL SIGNED BY
P. BURKE

Dudley M. Hanson, P.E.
Chief, Planning Division

Enclosure

Copies Furnished:

Mr. Harold Hassen
Illinois Department of Conservation
Lincoln Tower Plaza, Room 310
524 South Second Street
Springfield, Illinois 62701-1787 (wo/enclosure)

Mr. Michael Wiant
Illinois State Museum
Research and Collections Lab
1920 South 10 1/2 Street
Springfield, Illinois 62703 (wo/enclosure)

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF:

October 11, 1996

Planning Division

Mr. Robert McLeese
State Soil Scientist
U.S. Department of Agriculture
Natural Resource
Conservation Service
1902 Fox Drive
Champaign, Illinois 61820

Dear Mr. McLeese:

The Rock Island District of the U.S. Army Corps of Engineers is currently preparing a Definite Project Report (DPR) with Environmental Assessment (EA) for the rehabilitation of Rice Lake State Fish and Wildlife Area (SFWA), Illinois. Rice Lake has been funded for design as a Habitat Rehabilitation and Enhancement Project of the Upper Mississippi River System - Environmental Management Program under authority of the Water Resources Development Act of 1986.

In accordance with the provisions of Section 906(e) of the Water Resources Development Act of 1986 (Public Law 99-662), cost sharing for general design and construction would be 75 percent Federal/25 percent non-Federal. The non-Federal sponsor for this project would be the Illinois Department of Natural Resources (ILDNR).

The Rice Lake SFWA is a 5,592-acre complex of natural backwater lakes and wetlands located on the right descending bank of the Illinois River between River Mile 132 and 138, in Fulton County, Illinois (see Enclosure 1). The project area is owned by the State of Illinois and is managed as a conservation area.

The overall goal of the Habitat Rehabilitation and Enhancement Project for the Rice Lake SFWA is the restoration of wetland habitat. The following objectives have been identified to meet the restoration goal: (1) increase the rate of success of submergent/emergent aquatic vegetation; (2) increase food and shelter for wildlife; (3) provide egress for fish from Rice Lake during drawdown periods; and, (4) improve bottomland hardwood and native warm season grass diversity and quality.

Several measures to accomplish these objectives are currently being evaluated for the DPR. Measures to fully accomplish objectives 2, 3, and 4 above would require acquisition by the ILDNR of the Duck Island property. This property was identified in the ILDNR's 1989 Natural Resource Management Plan for the Rice Lake SFWA as a top priority for acquisition.

The Duck Island peninsula is located in portions of Sections 27, 28, 33, and 34, Township 6 North, Range 5 East, and a portion of Section 4, Township 5 North, Range 5 East, Fulton County, Illinois. This privately owned inholding is surrounded on all sides by the Rice Lake SFWA, with the exception of a narrow corridor bordering the access road. The total area of the property that would be acquired is approximately 1,200 acres. Approximately 600 acres of this property is leased for farming. The remaining acreage is a combination of open water areas in Big Lake, wooded areas, and a gravel quarry at the southern end of the peninsula.

Potential habitat enhancement features being evaluated include planting mast producing trees and warm season grasses on approximately 300 acres of the farmed land. The remaining farmed land, approximately 300 acres, would continue to be managed under agricultural leases and would not be converted to wildlife habitat.

Draft soil survey maps provided by the Lewistown District office are enclosed as Enclosures 2 and 3. Additional soil survey information was provided by the Jacksonville District office (Enclosure 4).

By submittal of the enclosed Form AD-1006 (Enclosure 5), we request a determination from your office as to whether the proposed project site contains farmland subject to the provisions of the Farmland Protection Policy Act of 1981. The DPR and EA being prepared for this action will be provided to your office for review.

We request that you return the completed Form AD-1006 to us within 45 days of the date of this letter.

If you have any questions, please call Ms. Charlene Carmack of our Environmental Analysis Branch, telephone 309/794-5570. Written comments may be sent to our address above, ATTN: Planning Division (Charlene Carmack).

Sincerely,

ORIGINAL SIGNED BY

Dudley M. Hanson, P.E.
Chief, Planning Division

Enclosures

Copies Furnished:

Mr. Bill Douglass
Illinois Department of Natural Resources
Rice Lake State Fish and Wildlife Area
R.R. 3, Box 91
Canton, Illinois 61520 (w/enclosures)

Mr. James Hartwig
Illinois Department of Agriculture
Division of Natural Resources
State Fairgrounds
P.O. Box 19281
Springfield, Illinois 62794 (w/enclosures)

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request October 11, 1996
Name Of Project Rice Lake State Fish and Wildlife Area	Federal Agency Involved U.S. Army Corps of Engineers, Rock Island
Proposed Land Use State Conservation/Refuge Area	County And State Fulton County, Illinois
PART II *(To be completed by SCS)*	Date Request Received By SCS 10-24-96

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply — do not complete additional parts of this form)*. Yes ☒ No ☐	Acres Irrigated —	Average Farm Size 321
Major Crop(s) Corn, Soybeans, Wheat, Hay	Farmable Land In Govt. Jurisdiction Acres: 29,633,500 % 97	Amount Of Farmland As Defined in FPPA Acres: 27,695,900 % 91
Name Of Land Evaluation System Used Illinois	Name Of Local Site Assessment System Statewide	Date Land Evaluation Returned By SCS 11-5-96

	Maximum Points	Site A	Site B	Site C	Site D
PART III *(To be completed by Federal Agency)*		Alternative Site Rating			
A. Total Acres To Be Converted Directly		300			
B. Total Acres To Be Converted Indirectly					
C. Total Acres In Site		1200			
PART IV *(To be completed by SCS)* Land Evaluation Information					
A. Total Acres Prime And Unique Farmland		290			
B. Total Acres Statewide And Local Important Farmland		10			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted		0.001			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value		56.9			
PART V *(To be completed by SCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*		81			
PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use	15	15			
2. Perimeter In Nonurban Use	10	10			
3. Percent Of Site Being Farmed	20	20			
4. Protection Provided By State And Local Government	20	20			
5. Distance From Urban Builtup Area	15	15			
6. Distance To Urban Support Services	15	10			
7. Size Of Present Farm Unit Compared To Average	10	10			
8. Creation Of Nonfarmable Farmland	10	10			
9. Availability Of Farm Support Services	5	3			
10. On-Farm Investments	20	10			
11. Effects Of Conversion On Farm Support Services	10	0			
12. Compatibility With Existing Agricultural Use	10	5			
TOTAL SITE ASSESSMENT POINTS	160	128			
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	81			
Total Site Assessment *(From Part VI above or a local site assessment)*	160	128			
TOTAL POINTS *(Total of above 2 lines)*	260	209			

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☒ No ☐

Reason For Selection:

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF:

November 29, 1996

Planning Division (1165-2-26a)

Mr. Harold Hassen
Chief Archeologist
Illinois Department
of Conservation
Lincoln Tower Plaza, Room 310
524 South Second Street
Springfield, Illinois 62701-1787

Dear Mr. Hassen:

The Rock Island District of the U.S. Army Corps of Engineers (Corps) has been coordinating with the Department of Natural Resources concerning the Rice Lake Complex Habitat Rehabilitation and Enhancement Project (HREP). The HREP is a part of the Upper Mississippi River System - Environmental Management Program (UMRS-EMP).

Coordination with your agency is promulgated under Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended. In compliance with NHPA, the Corps contracted a Scope of Work (SOW) with the Illinois State Museum, Springfield, Illinois, to conduct a Phase I survey for historic properties. The SOW was provided to your agency to aid in review and comment on our reports.

The attached draft report (Attachment 1) is provided for your review and comment. The report, entitled <u>Phase I Intensive Archaeological Survey for Historic Properties Within the Upper Mississippi River System-Environmental Management Program (UMRS-EMP) for the Rice Lake State Conservation Area, Fulton County, West-Central, Illinois--Draft</u> (archeology draft report), dated November 1996, was prepared by the Illinois State Museum, Springfield, Illinois, under Corps Indefinite Quantities Contract Number DACW25-93-D-0014, Delivery Order Number 17. Page 25 of the archeology draft report documents 27 archaeological sites, including 7 prehistoric isolates finds, 14 prehistoric sites, 1 historic site, and 5 mixed component historic and prehistoric sites, and that 4 of these sites are potentially eligible to the National Register of Historic Places (Site 11F2745, Site 11F2746, Site 8, and Site 23).

Following the recommendations of the report, the Corps will provide a 30-meter easement along the perimeter of Sites 11F2745, 11F2746, Site 8, and Site 23, so that (1) the planting of trees with power planters does not impact the four sites and (2) the roots of future mature trees do not grow into the sites (p. 25).

The Corps has determined that the Copperas Creek Lock is individually eligible for listing to the National Register of Historic Places (NRHP) under Criteria A and C. This lock was constructed by the Corps and the State of Illinois between 1873 and 1877 as part of the Illinois River navigation improvement and is presently owned by the city of Canton, Illinois. The history and significance of this lock and the NRHP eligible Multiple Property Chicago to Grafton, Illinois, Navigable Water Link, 1836-1945, is extensively documented in the Corps' June 1996 report entitled Architectural and Engineering Resources of the Illinois Waterway Between 130th Street in Chicago and La Grange, Volume I (architectural draft report) prepared by American Resources Group Ltd., Carbondale, Illinois, under Indefinite Quantities Contract Number DACW25-93-D-0012, Delivery Order Number 23. A copy of the draft architectural report has been provided for your files and your agency concurred with the findings by letter dated November 4, 1996 (Attachment 2).

Two separate locations have been studied for the location of the proposed Rice Lake UMRS-EMP Pump Station. The preferred location is located approximately 100 meters from the closest point of the Copperas Creek Lock and buffered by mature trees and undergrowth (Attachment 3). Those significant characteristics of the Copperas Creek Lock under Criteria A and C (as documented within the architectural draft report) will remain. The primary visual boundaries of the lock are between the ground surface and waterline, while the proposed Pump Station will be visually hidden from Copperas Creek Lock by vegetation, an unobtrusive color to blend into surrounding vegetation, and have a low profile well below extant tree height.

By applying the Criteria of Effect under 36 CFR Part 800.9(a): "Protection of Historic Properties," the Corps determines that **No Effect** to the NRHP eligible Copperas Creek Lock would occur from the construction of the Rice Lake Complex HREP Project and Pump Station.

Please provide your comments or concurrence with the recommendations and findings of this archeological draft report, as promulgated under Section 106 of the NHPA, and determination of **No Effect** pursuant to 36 CFR Part 800.5(b). If no comments or objections are made within 30 days after receipt of this letter, the Corps will assume your concurrence with the findings, recommendations and determination, and proceed with the Rice Lake Complex HREP, as proposed.

If you should have questions concerning the Rice Lake Complex HREP, the Corps' Phase I archeological survey and contract, or the determination of **No Effect** to the NRHP eligible Copperas Creek Lock, please call Mr. Ron Deiss of our Environmental Analysis Branch, telephone 309/795-5185, or write to our address above, ATTN: Planning Division (Ron Deiss).

Sincerely,

ORIGINAL SIGNED BY
P. BURKE

Dudley M. Hanson, P.E.
Chief, Planning Division

Attachments

Copies Furnished:

Ms. Anne Haaker
Deputy State Historic
Preservation Officer
Illinois Historic
Preservation Agency
Old State Capitol
Springfield, Illinois 62704 (wo/attachments)

Mr. Bill Douglas
Site Manager
Rice Lake State Fish and Wildlife Area
19721 North U.S. 24
Canton, Illinois 61520 (wo/attachments)

Mr. Michael Wiant
Museum Director
Illinois State Museum
Research and Collections Lab
1920 South 10 1/2 Street
Springfield, Illinois 62703 (wo/attachments)

Copies Furnished (Continued):

Mr. Robert Anderson
City Engineer
6 East Elm Street
Canton, Illinois 61520 (wo/attachments)

Mr. Donald Edwards
Mayor
City Hall
210 East Chestnut
Canton, Illinois 61520 (wo/attachments)

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF

November 29, 1996

Planning Division (1165-2-26a)

Ms. Anne Haaker
Deputy State Historic
Preservation Officer
Illinois Historic
Preservation Agency
Old State Capitol
Springfield, Illinois 62704

Dear Ms. Haaker:

The Rock Island District of the U.S. Army Corps of Engineers (Corps) has been coordinating with your agency concerning the Rice Lake Complex Habitat Rehabilitation and Enhancement Project (HREP). The HREP is a part of the Upper Mississippi River System - Environmental Management Program (UMRS-EMP).

Coordination with your agency is promulgated under Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended. In compliance with NHPA, the Corps contracted a Scope of Work (SOW) with the Illinois State Museum, Springfield, Illinois, to conduct a Phase I survey for historic properties. The SOW was provided to your agency to aid in review and comment on our reports.

The attached draft report (Attachment 1) is provided for your review and comment. The report, entitled Phase I Intensive Archaeological Survey for Historic Properties Within the Upper Mississippi River System-Environmental Management Program (UMRS-EMP) for the Rice Lake State Conservation Area, Fulton County, West-Central, Illinois--Draft (archeology draft report), dated November 1996, was prepared by the Illinois State Museum, Springfield, Illinois, under Corps Indefinite Quantities Contract Number DACW25-93-D-0014, Delivery Order Number 17. Page 25 of the archeology draft report documents 27 archaeological sites, including 7 prehistoric isolates finds, 14 prehistoric sites, 1 historic site, and 5 mixed component historic and prehistoric sites, and that 4 of these sites are potentially eligible to the National Register of Historic Places (Site 11F2745, Site 11F2746, Site 8, and Site 23).

Following the recommendations of the report, the Corps will provide a 30-meter easement along the perimeter of Sites 11F2745, 11F2746, Site 8, and Site 23, so that (1) the planting of trees with power planters does not impact the four sites and (2) the roots of future mature trees do not grow into the sites (p. 25).

The Corps has determined that the Copperas Creek Lock is individually eligible for listing to the National Register of Historic Places (NRHP) under Criteria A and C. This lock was constructed by the Corps and the State of Illinois between 1873 and 1877 as part of the Illinois River navigation improvement and is presently owned by the city of Canton, Illinois. The history and significance of this lock and the NRHP eligible Multiple Property Chicago to Grafton, Illinois, Navigable Water Link, 1836-1945, is extensively documented in the Corps' June 1996 report entitled Architectural and Engineering Resources of the Illinois Waterway Between 130th Street in Chicago and La Grange, Volume I (architectural draft report) prepared by American Resources Group Ltd., Carbondale, Illinois, under Indefinite Quantities Contract Number DACW25-93-D-0012, Delivery Order Number 23. A copy of the draft architectural report has been provided for your files and your agency concurred with the findings by letter dated November 4, 1996 (Attachment 2).

Two separate locations have been studied for the location of the proposed Rice Lake UMRS-EMP Pump Station. The preferred location is located approximately 100 meters from the closest point of the Copperas Creek Lock and buffered by mature trees and undergrowth (Attachment 3). Those significant characteristics of the Copperas Creek Lock under Criteria A and C (as documented within the architectural draft report) will remain. The primary visual boundaries of the lock are between the ground surface and waterline, while the proposed Pump Station will be visually hidden from Copperas Creek Lock by vegetation, an unobtrusive color to blend into surrounding vegetation, and have a low profile well below extant tree height.

By applying the Criteria of Effect under 36 CFR Part 800.9(a): "Protection of Historic Properties," the Corps determines that **No Effect** to the NRHP eligible Copperas Creek Lock would occur from the construction of the Rice Lake Complex HREP Project and Pump Station.

Please provide your comments or concurrence with the recommendations and findings of this archeological draft report, as promulgated under Section 106 of the NHPA, and determination of **No Effect** pursuant to 36 CFR Part 800.5(b). If no comments or objections are made within 30 days after receipt of this letter, the Corps will assume your concurrence with the findings, recommendations and determination, and proceed with the Rice Lake Complex HREP, as proposed.

If you should have questions concerning the Rice Lake Complex HREP, the Corps' Phase I archeological survey and contract, or the determination of **No Effect** to the NRHP eligible Copperas Creek Lock, please call Mr. Ron Deiss of our Environmental Analysis Branch, telephone 309/795-5185, or write to our address above, ATTN: Planning Division (Ron Deiss).

Sincerely,

Dudley M. Hanson, P.E.
Chief, Planning Division

Attachments

Copies Furnished:

Mr. Harold Hassen
Chief Archeologist
Illinois Department of Conservation
Lincoln Tower Plaza, Room 310
524 South Second Street
Springfield, Illinois 62701-1787 (wo/attachments)

Mr. Bill Douglas
Site Manager
Rice Lake State Fish and Wildlife Area
19721 North U.S. 24
Canton, Illinois 61520 (wo/attachments)

Mr. Michael Wiant
Museum Director
Illinois State Museum
Research and Collections Lab
1920 South 10 1/2 Street
Springfield, Illinois 62703 (wo/attachments)

Copies Furnished (Continued):

Mr. Robert Anderson
City Engineer
6 East Elm Street
Canton, Illinois 61520 (wo/attachments)

Mr. Donald Edwards
Mayor
City Hall
210 East Chestnut
Canton, Illinois 61520 (wo/attachments)

Illinois Historic Preservation Agency

1 Old State Capitol Plaza • Springfield, Illinois 62701-1507 • (217) 782-4836 • TTY (217) 524-7128

Fulton County
Rice Lake State Conservation Area
COERi-Rice Lake Habitat Rehabilitation and Enhancement Project (HREP)-Upper Mississippi River System-Environmental Management Program (UMRS-EMP)
Copperas Creek Lock; Site 11F2746, Site 11F2745, Site 8, Site 23
DACW25-93-D-0014
IHPA Log #04120596, #961205001P-F

December 6, 1996

Dudley Hanson, P.E., Chief, Planning Div
Department of the Army
Rock Island District, Corps of Engineers
Clock Tower Bldg., P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Mr. Hanson:

We have reviewed the referenced project. The Copperas Creek Lock is eligible for listing on the National Register of Historic Places. Archaeological Site 11F2745, Site 11F2746, Site 8 and Site 23 are potentially eligible for listing on the National Register.

In our opinion the project, as proposed, will have no effect on sites or structures eligible or potentially eligible for listing on the National Resgister of Historic Places. Specifically, the proposed pump station construction near Copperas Creek Lock as outlined in your November 29, 1996 letter will not affect those qualities which make the structure eligible.

Additionally, the avoidance of Archaeological Site 11F2745, Site 11F2746, Site 8 and Site 23, as recommended in the draft "Phase I Intensive Archaeological Survey for Historic Properties within the Upper Mississippi River System-Environmental Management Program (UMRS-EMP) for the Rice Lake State Conservation Area, Fulton County, West-Central Illinois," will have no effect on these sites which may be potentially eligible for listing on the National Register of Historic Places.

We, therefore, have no objection to the undertaking proceeding as planned. Should the project be modified from what is now proposed, please let our office know so that we may reassess any impacts to historic properties.

When the final report is sent to our office it should contain the appropriate State site file numbers throughout the text and tables. Also, the recommendations section should contain a table indicating the National Register eligibility recommentations (i.e., eligible, potentially eligible, not eligible) for all 27 archaeological sites.

A copy of this letter should be kept on file as evidence of compliance with Section 106 of the National Historic Preservation Act of 1966, as amended.

If you have any questions regarding the lock please contact Ms. Tracey A. Sculle, Cultural Resources Manager, at 217/785-3977. Any questions regarding the archaeological sites and the final report should be addresed to Mr. Joseph S. Phillippe, Staff Archaeologist, at 217/785-1279.

Sincerely,

Anne E. Haaker

Anne E. Haaker
Deputy State Historic
Preservation Officer

AEH:TAS

cc: Ron Deiss, COE-Rock Island District
Dr. Harold Hassen, IDNR
Dr. Dale Henning, Illinois State Museum

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF:

December 16, 1996

Planning Division (1165-2-26a)

Dr. Dale Henning
Illinois State Museum
Research and Collections Lab
1920 South 10 1/2 Street
Springfield, Illinois 62703

Dear Dr. Henning:

The Rock Island District of the U.S. Army Corps of Engineers (Corps) has reviewed the draft report entitled Phase I Intensive Archaeological Survey for Historic Properties Within the Upper Mississippi River System - Environmental Management Program (UMRS-EMP) for the Rice Lake State Conservation Area, Fulton County, West-Central, Illinois--Draft dated November 1996. The report was prepared under Corps Indefinite Quantities Contract Number DACW25-93-D-0014, Delivery Order Number 17.

The Corps concurs with the recommendations of the draft report. The Corps will provide a 30-meter easement along the perimeter of Sites 11F2745, 11F2746, Site 8, and Site 23, so that (1) the planting of trees with power planters does not impact the four sites and (2) the roots of future mature trees do not grow into the sites (p. 25).

The Corps has determined that the Copperas Creek Lock is individually eligible for listing to the National Register of Historic Places (NRHP) under Criteria A and C. Two separate locations have been studied for the location of the proposed Rice Lake UMRS-EMP Pump Station. The preferred location is located approximately 100 meters from the closest point of the Copperas Creek Lock and buffered by mature trees and undergrowth. Those significant characteristics of the Copperas Creek Lock under Criteria A and C will remain. The primary visual boundaries of the lock are between the ground surface and waterline, while the proposed Pump Station will be visually hidden from Copperas Creek Lock by vegetation, an unobtrusive color to blend into surrounding vegetation, and have a low profile well below extant tree height.

By applying the Criteria of Effect under 36 CFR Part 800.9(a): "Protection of Historic Properties," the Corps determines that **No Effect** to the NRHP eligible Copperas Creek Lock would occur from the construction of the Rice Lake Complex HREP Project and Pump Station.

The attached correspondence from the Illinois Historic Preservation Agency (IHPA), dated December 6, 1996 (IHPA LOGS Nos. 04120596 and 961205001P-F), concurs with the draft report recommendations and the Corps' determination of **No Effect** to the Copperas Creek Lock and its National Register of Historic Places eligibility. Also, the IHPA requests two modifications to the final report. The Corps agrees with the IHPA and requires those modifications within the final reports for acceptance.

The Corps appreciates the timely manner in which you, Ms. Jacqueline A. Ferguson, and Mr. Edwin R. Hajic completed the project and draft report. Dr. Harold Hassen of the Division of Planning, Illinois Department of Natural Resources, Springfield, Illinois, concurred within the findings and recommendations of the draft report by telephone on December 16, 1996. Dr. Hassen stated that no written comment will be provided to the Corps.

Please include the attached IHPA comment within an appendix within the final report and provide 30 copies of the final report as stated in paragraph 7.1 of the Scope of Work.

If you should have questions concerning the IHPA comment and modifications to the final report, please call Mr. Ron Deiss of our Environmental Analysis Branch, telephone 309/795-5185, or write to our address above, ATTN: Planning Division (Ron Deiss).

Sincerely,

ORIGINAL SIGNED BY
P. BURKE
Dudley M. Hanson, P.E.
Chief, Planning Division

Attachment

Copies Furnished:

Ms. Anne Haaker
Deputy State Historic
  Preservation Officer
Illinois Historic
  Preservation Agency
Old State Capitol
Springfield, Illinois 62704 (w/attachment)

Mr. Harold Hassen
Chief Archeologist
Illinois Department of Conservation
Lincoln Tower Plaza, Room 310
524 South Second Street
Springfield, Illinois 62701-1787 (w/attachment)

Mr. Bill Douglas
Site Manager
Rice Lake State Fish and Wildlife Area
19721 North U.S. 24
Canton, Illinois 61520 (w/attachment)

Mr. Robert Anderson
City Engineer
6 East Elm Street
Canton, Illinois 61520 (w/attachment)

Mr. Donald Edwards
Mayor
City Hall
210 East Chestnut
Canton, Illinois 61520 (w/attachment)

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO ATTENTION OF:

February 5, 1997

Planning Division (11-2-240a.2.01)

Ms. Anne Haaker
Deputy State Historic
Preservation Officer
Illinois Historic
Preservation Agency
Old State Capitol
Springfield, Illinois 62704

Dear Ms. Haaker:

The Rock Island District of the U.S. Army Corps of Engineers (Corps) has enclosed two copies of the final report entitled: Phase I Intensive Archaeological Survey for Historic Properties Within the Upper Mississippi River System - Environmental Management Program (UMRS-EMP) for the Rice Lake State Conservation Area, Fulton County, West-Central, Illinois (archeology draft report), dated January 1997. The report was prepared by the Illinois State Museum, Springfield, Illinois, under Corps Indefinite Quantities Contract Number DACW25-93-D-0014, Delivery Order Number 0017.

Since your agency has concurred with the findings of the draft report, with modifications which were made in the final report (see Appendix E of the archeology draft report), no future reply is expected from your agency. Because this report contains site descriptive and location information, **this report is not for public distribution.** Ten copies of this report will be curated at the Illinois State Museum, Research and Collections Center, Springfield, Illinois.

If any historic properties are encountered, uncovered, or discovered during project construction, all disturbance activities will halt which could potentially affect the historic properties. The Corps will notify the Illinois Historic Preservation Agency, pursuant to Section 106 of the National Historic Preservation Act and its implementing regulations 36 CFR Part 800: "Protection of Historic Properties," and will coordinate measures to determine significance, and avoid and minimize any potential effects.

We appreciate the timely and professional manner in which you and Mr. Joseph Phillippe contributed to this compliance effort. Please notify Mr. Phillippe of our recognition of his services and contributions to this project.

If you should have questions concerning the Rice Lake Complex HREP, the Corps' Phase I archeological draft report survey, or the determination of **No Effect** to the NRHP eligible Copperas Creek Lock, please call Mr. Ron Deiss of our Environmental Analysis Branch, telephone 309/795-5185, or write to our address above, ATTN: Planning Division (Ron Deiss).

Sincerely,

Dudley M. Hanson, P.E.
Chief, Planning Division

Enclosure

MFR: Coordination of final Phase I archeological draft report with the IL SHPO on the Rice Lake UMRS-EMP, Fulton County, IL Waterway, IL.

Copies Furnished:

Mr. Harold Hassen
Chief Archeologist
Illinois Department of Conservation
Lincoln Tower Plaza, Room 310
524 South Second Street
Springfield, Illinois 62701-1787 (w/enclosure)

Mr. Bill Douglas
Site Manager
Rice Lake State Fish and Wildlife Area
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Mr. Michael Wiant
Museum Director
Illinois State Museum
Research and Collections Lab
1920 South 10 1/2 Street
Springfield, Illinois 62703 (wo/enclosure)

Dr. Thomas Emerson
Illinois Archeological Survey
Department of Anthropology
University of Illinois
109 Davenport Hall
607 South Mathews Avenue
Urbana, Illinois 61801 (w/enclosure, 2 copies)

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6 East Elm Street
Canton, Illinois 61520 (wo/enclosure)

Mr. Donald Edwards
Mayor
City Hall
210 East Chestnut
Canton, Illinois 61520 (wo/enclosure)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Rock Island Field Office (ES)
4469 - 48th Avenue Court
Rock Island, Illinois 61201

IN REPLY REFER TO:

COM: 309/793-5800
FAX: 309/793-5804

February 24, 1997

Colonel Charles S. Cox
District Engineer
U.S. Army Engineer District
Rock Island
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Cox:

This letter constitutes our draft Fish and Wildlife Coordination Act (FWCA) report for the Rice Lake State Fish and Wildlife Area Habitat Rehabilitation and Enhancement Project (HREP) in LaGrange Pool, Illinois River, Fulton County, Illinois. It has been prepared under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat.401, as amended; 16 U.S.C. 661 et seq.); the Endangered Species Act of 1973, as amended; and in accordance with the Fish and Wildlife Service's Mitigation Policy.

The Rice Lake State Fish and Wildlife Area HREP is a component of the Upper Mississippi River System Environmental Management Program (EMP) authorized in Section 1103 of the Water Resources Development Act of 1986. The goal of the EMP is to implement "...numerous enhancement efforts...to preserve, protect and restore habitat that is deteriorating due to natural and man-induced activities."

DESCRIPTION OF THE PROJECT AREA

The study area is located adjacent to the right descending bank of the Illinois River between river miles 132.5 and 138 near the town of Banner, Illinois. Presently, the 5,592-acre area is owned in fee title and managed by the Illinois Department of Natural Resources. However, a large private land inholding, known as Duck Island, is situated in the middle of the state-owned lands. Primarily an upland agricultural area that is intensively farmed, Duck Island contains a gravel quarry pit with over 150 acres of deeper water suitable to support fish. The State is currently negotiating with the landowners to purchase the island outright. Upon acquisition of Duck Island the total acreage of the Rice Lake State Fish and Wildlife Area would exceed 6000 acres.

As an actively managed state fish and wildlife complex, Rice Lake provides a unique and diverse wildlife area with importance to resident and migrating waterfowl. Located adjacent to the Banner Marsh State Fish and Wildlife Area, the Rice Lake area compliments the deeper water habitats of Banner Marsh with several thousand acres of shallow water habitats that can be manipulated seasonally. Over eleven thousands acres of critical migratory bird habitat are under management by the State between the two sites. Fish and wildlife habitats at Banner Marsh are currently being restored under a similar HREP project initiated several years ago.

PROJECT OBJECTIVES

The goals of the Rice Lake HREP are to rehabilitate, enhance, and protect aquatic, forested and nonforested wetlands, and upland and grassland habitats for the benefit of resident and migratory birds. Both upland game and nongame species will benefit from increased habitat diversity and better management capabilities on site. These goals will be accomplished through a combination of construction features and management practices. Specifically, an increase in nesting and brood habitat as well as feeding and loafing areas for migratory birds is a priority. Creation of a deep-water refuge will provide for an improved fishery resource and reduce the incidence of avian botulism which is of great concern. Increased diversity of the area for resident upland species populations like deer, turkey, and pheasant will be enhanced through the combination of grassland and hardwood plantings described below. In addition, the integrity and reliability of the entire marsh complex will be improved by upgrading the existing dike system.

METHODOLOGY

Habitat analysis of existing study area conditions, future conditions without the project and impacts of the several proposed alternatives and increments was accomplished using the Wildlife Habitat Appraisal Guide (WHAG) procedures developed by the Missouri Department of Conservation and the USDA Natural Resources Conservation Service. This analysis employed a multi-agency team approach with representatives from the Corps of Engineers, the Illinois Department of Natural Resources, the Illinois Natural History Survey, as well as the Service.

The WHAG analysis is a numerical system for evaluating the quality and quantity of particular habitats for species selected by the WHAG team members. The qualitative component of the analysis is known as the habitat suitability index (HSI) and is rated on a 0.1 to 1.0 scale. The suitability of a given habitat type for a set of evaluation species is determined by the qualitative characteristics of the habitat type. The WHAG procedures include the use of limiting factors, habitat requirements for an individual species during a critical time of year. Absence of one or more habitat characteristics makes the habitat unsuitable and results in the lowest HSI value of 0.1. The quantitative component of the WHAG analysis is the measure of acres of habitat that are available for the selected target species. From the qualitative and quantitative determinations, the standard unit of measure, the Habitat Unit (HU), is calculated using the formula (HSI x Acres = HU's).

Existing habitat conditions were evaluated on-site by the team, whereas future conditions with and without the project were estimated using the expertise of team members. The team considered wetland and upland habitats and both game and nongame species aspects of the project. Target species were selected to represent groups of species to be able to focus in on, and evaluate, the goals and objectives of the project. Several planning iterations were required as the project evolved and engineering data was refined.

For project planning and impact analysis, project life was established as 50 years. To facilitate comparison, target years were established at 0 (existing conditions) 1, 25 and 50 years. Habitat suitability indices (HSI) and average annual habitat units (AAHU's) for each evaluation species were calculated to reflect expected habitat conditions over the life of the project.

THREATENED AND ENDANGERED SPECIES

To facilitate compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, Federal agencies are required to obtain from the Fish and Wildlife Service information concerning any species, listed or proposed to be listed, which may be present in the area of a proposed action.

Therefore, we are furnishing you the following list of species which may be present in the concerned area:

Classification	Common Name	Scientific Name	Habitat
Endangered	Bald eagle	Haliaeetus leucocephalus	Winters along major rivers and reservoirs
Threatened	Decurrent false aster	Boltonia decurrens	disturbed alluvial soil

The bald eagle winters in the Illinois River valley regularly. Eagles are present in the Rice Lake area from late September or early October through April. Both diurnal perching/loafing and night roosting areas have been documented in the complex. Avoiding impacts to the night roost areas and minimal clearing of the larger perch trees used by the eagles during the day is recommended. In addition, construction activities will need to be considerate of the seasonal window from late September to late April when eagles are using the Rice Lake area.

Construction activities will need to be scheduled to avoid disturbance of the eagles, especially at the night roost sites.

The decurrent false aster has been documented within the Rice Lake project area with one location containing a population of 250-300 plants. Other sites containing lesser numbers of the plant are also documented. The species is somewhat opportunistic, responding to periodic flood events to colonize an area. It is possible that new populations will be discovered depending on future hydrologic cycles and the disturbance of soil as a result of construction activities. Known populations of decurrent false aster must be avoided during construction of the project and if new populations are discovered during construction, additional coordination with this agency is mandatory at that time.

With consideration of the above recommendations the proposed project will not negatively affect these species or their habitats and this precludes the need for further action on this project as required under Section 7 of the Endangered Species Act of 1973, as amended. Should this project be modified or new information indicate endangered species may be affected, consultation should be initiated.

EXISTING FISH AND WILDLIFE RESOURCES

For the purpose of evaluation, the study area was categorized according to the following habitat types: wetland, upland and aquatic. These habitat types were further subdivided into the following categories: nonforested wetland, upland hardwoods, cropland, and grassland. Table (1) presents the acreage calculations of existing habitat types.

Table 1. Rice Lake HREP existing habitat types and acreage.

Wetland habitat type	Acres
Aquatic (deep water)	0
Non-forested wetland	3054

Upland habitat type	Acres
Upland hardwoods	0
Cropland	600
Grassland	0

The results of the WHAG analysis for existing conditions indicate a broad range of values for the evaluation species, reflective of the variety of habitat requirements for those species (Table 2).

Table 2. Rice Lake HREP existing habitat suitability and corresponding Habitat Unit values.

SPECIES	HSI	HU
Mallard	0.10	0.00
Canada goose	0.10	0.00
Least bittern	0.71	2117.00
Lesser yellowlegs	0.59	1797.00
Muskrat	0.29	867.00
King rail	0.10	0.00
Green-backed heron	0.69	2253.00
Fox squirrel	0.00	0.00
White-tailed deer	0.64	385.00
Turkey	0.00	0.00
Dickcissel	0.00	0.00
Bluebird	0.00	0.00
Bobwhite quail	0.11	864.00
Cottontail rabbit	0.10	0.00
Indigo bunting	0.00	0.00
Ring-necked pheasant	0.50	1635.00
Wood thrush	0.00	0.00
Kentucky warbler	0.00	0.00
Catfish	0.10	0.00
Crappie	0.10	0.00
Largemouth bass	0.10	0.00
Gizzard shad	0.10	0.00
Common carp	0.10	0.00
Bluegill	0.10	0.00
Black bullhead	0.10	0.00

The habitat values calculated using the WHAG matrix are consistent with past field data collected at the project site. The mixture of habitats within the marsh fulfill the life of many resident and nonresident wildlife species as is reflected by the wide range of habitat values of the above target species. However, an HSI value of 0.1 is calculated by the model when a critical component of a species' life requisite is absent. A corresponding "0" numerical value is then indicated in the Habitat Unit column, but this does not mean that those species represented by that particular target species are not present in the project area. Instead, it is indicative that the habitat is less than suitable for that group of species as will be discussed below.

FUTURE WITHOUT PROJECT

The No Federal Action alternative is the future without the project condition with the Rice Lake marsh complex continuing to function primarily as floodplain wetland, with minor successional changes occurring over time. The area will be actively managed with the existing pump facility, but there would be no new construction under this alternative. Another critical component of the continued success of the marsh complex, the protective dike system, will be subjected to further degradation over time, jeopardizing management of the entire complex. The without project values that have been calculated for this analysis assume that the dike system remains intact over the next 50 years. Erosional forces of the Illinois River at flood stages further degrade the protective dike system each year, increasing the potential for failure at some point in the future. The loss of the protective dike system would permanently alter the habitat types and water regime of the Rice Lake complex subjecting the area to the flooding and sedimentation of the Illinois River. Habitat values projected under this scenario would be much lower, reflecting the overall negative impacts that would result without the afforded protection of the dike. In addition, the lack of deep water for fish refuge will result in continued fish kills which have caused recurrent avian botulism outbreaks at Rice Lake.

FUTURE WITH PROJECT

Enhancement options at the project site included increasing the quality of existing habitat types, increasing the acreage of a particular habitat type(s), or a combination of both. Several alternatives were evaluated using the WHAG methodology to determine the best management of the habitat types in project area. To meet the overall goal of increasing the reliability of mid-migration habitats for migratory birds, continued active management of the area was evaluated. This included evaluating the existing degree of flood protection, the current water control and pumping facilities as well as improved pumping capacity to flood additional acreage in the fall after desired vegetation has matured. One of the primary objectives is to ensure the future value of the Rice Lake area by protecting it with a reliable dike system. Secondly, a goal of increasing the quality and acres of habitat for fish and waterfowl, dabbling ducks in particular, was identified.

Thirdly, the overall diversity of habitats in the area would be increased through acquisition of Duck Island. The island's croplands would be converted to native grasses (the prairie ecosystem is all but lost in Illinois) and plantings of hardwood mast producing trees. In addition, a deep water fish refuge would be created in the gravel pits to reduce the number of fish kills occurring in Rice Lake during low water drawdowns.

Proposed Array of Options Considered:

- Water control dike upgrade with gated outlet and rock weir overflow.

This option involves the necessary upgrade of the perimeter dike system with dredged sand from the Illinois River channel and/or selective excavation of borrow from the interior of the marsh. Two alternatives of upgrading the dike were considered: (1) top of dike at elevation 440 with the spillway at elevation 438 and (2) top of dike at elevation 442 with the spillway at elevation 440. The rock spillway structure will be constructed at the lower end of Rice Lake, on top of an existing deteriorated cross-dike known locally as the hate levee. During higher flood pulses on the Illinois River, the spillway will allow the river to flood Rice Lake gradually from the downstream end of the area, equalizing the water level on both sides of the dike before it overtops the dike. This will reduce damage to the dike and the interior marsh during major flood events. To facilitate drawdown of the Rice Lake complex two 5-foot diameter gated culverts will be installed in the dike near Goose Lake. The culverts will be gravity fed and only function when the Illinois River level is lower than the water level in the marsh.

- Improved pumping capacity and network of distribution channels.

Several alternatives were considered for improving the ability to control water levels and distribute water throughout the Rice Lake wetland habitats. The existing pump station could be abandoned and a new pump station constructed above the old Copperas Creek lock. The new station would be a larger capacity pump (100,00 gpm) complete with new distribution channels to convey water to Big Lake as well as Rice Lake. Alternatively, the new pump station could be constructed with a similar capacity to the existing pump station (approximately 50,000 gpm) to supply water to Big Lake. The existing pump station would be kept in operation to pump water into Rice Lake. This alternative would have a lower initial cost (50,000 gpm pump vs. 100,000 gpm pump), but could have higher maintenance costs associated with it since the existing pump station frequently silts in and requires maintenance dredging.

- Warm season grass plantings.

This option would convert 200 acres of existing crop fields on Duck Island to native grass prairie (see Table 3). The plantings would include a mixture of warm season grasses like big and little bluestem, indiangrass, and side oats gramma, with the option of introducing prairie forbs into the site depending on seed availability and cost. A cool season component of grassland planting is also under consideration to provide green browse for Canada geese in the spring and summer months.

Table 3. Rice Lake HREP habitat types and acreage with warm season grass conversion.

Habitat	W/O	With
Cropland	600	400
Grassland	0	200

- Hardwood mast tree planting

This option would convert 100 acres of existing crop fields on Duck Island to a mixed hardwood planting (see Table 4). The planting would include a combination of the following tree species: pin oak, sycamore, bur oak, northern pecan, and swamp white oak.

Table 4. Rice Lake HREP habitat types and acreage with warm season grass conversion.

Habitat	W/O	With
Cropland	600	300
Grassland	0	200
Upland hardwoods	0	100

- Fish ingress/egress structure

This option involves placement of two 5-foot diameter, gated culverts between Rice Lake and the quarry pits of Duck Island. Carried in by flood events, fish become trapped in the shallow lake waters once the river recedes. Spring drawplants frequently result in fish kills. The link between the shallow manipulated waters of Rice Lake and the deeper permanent pool of the gravel pit will provide both winter and summer refugia for the fish trapped within the marsh complex. Construction of a fish passage structure would permit fish to escape to the deeper waters of the quarry during the drawndown phase as well as overwinter in the quarry pits when the rest of the shallow lake waters are frozen.

DISCUSSION

Evaluation of Alternatives

The success of the Rice Lake State Fish and Wildlife Area in providing a reliable mid-migration food source for the thousands of migratory birds that use the Illinois River flyway annually, lies in the ability to accomplish two primary objectives each year. The first is the need to drawdown the area in late spring to expose mudflats and promote a lush growth of annual plants which are protected from flooding until after the growing season. Second, is the capacity to reflood the area before arrival of the first migrants south in the fall and to be able to manipulate water levels as needed to meet specific management goals (i.e. mudflats for shorebirds vs. 2-feet of water for dabbling ducks).

Presently, the site managers have limited ability to drawn down the complex to encourage plant growth which is then subject to random flooding during the growing season and unpredictable flooding in the fall. In addition, the existing pump station is only adequate enough to flood Rice Lake proper, but inlet channel frequently silts in and must be dredged out. The Big Lake component of the complex is without a complete dike system around it and it floods when the river rises above elevation 434. Consequently, only a portion of the complex can be managed for food production with any predictability or reliability. This is reflected in the qualitative assessment of the WHAG analysis.

The wetland target species represented in the list of evaluation species presented earlier in Table 2. include: mallard, canada goose, green-backed heron, least bittern, lesser yellowlegs, muskrat, and king rail. The HSI values for these shallow water wetland species indicate that the area provides suitable habitat for a wide variety of species though the values are less than optimum for species like mallard and king rail. With a normal growing season and hydrologic cycle, the Rice Lake area attracts tens of thousands of waterfowl to the flooded moist soil plants of the marsh. However, these numbers drop significantly in years when the river remains high late into the spring and does not allow draw down of the marsh until well into the growing season, delaying or preventing the germination of the annual plants that the birds rely so heavily on. On the other hand, early fall floods may drown out the year's growth prior to arrival of the birds or flood plants too deep for dabbling ducks to utilize. Consequently, rehabilitation of the existing dike is critical to improving the overall management of the marsh. Predictability of annual success increases from the present 20% (2 out of 10 years) to 70% (7 out of 10 years) with a dike elevation at 442 and spillway elevation at 440. This represents a significant improvement in management opportunity without completely severing the backwater complex from the river's natural flood cycle. Periodic flood events are necessary to suppress woody invasion and set back annual weeds that compete with the moist soil plants. Elevation 442 represents this optimum elevation and is the preferred alternative.

As discussed above, the capacity to pump and draw down water is critical to successful waterfowl management during migration. While the managers at Rice Lake have an operational pump station at present, it is undersized to meet the demands of Big Lake and Goose Lake after the perimeter dike is rehabilitated. In addition, sedimentation has been a recurrent problem at the present pump station location resulting in higher maintenance costs. Construction of a new pump station with increased capacity located near the old Copperas Creek lock would serve as a reliable water source to the entire marsh complex. However, a new network of distribution channels would need to be constructed to convey water to both Rice and Big/Goose Lakes independently. While increased pumping capacity is preferred, the incremental analysis process will determine which alternative is the most cost effective.

Intensive management for waterfowl is usually contrary to fisheries management practices due to the shallow water levels needed for moist soil management. However, these low water levels and exposed mud flats can also have negative effects on waterfowl populations when fish kills occur. Fish trapped in the shallow lakes following flood events are subjected to the low water levels of the spring drawndown which results in lower dissolved oxygen levels and higher water temperatures and a subsequent fish kill. Decomposing fish serve as a host for maggots producing the toxin that causes avian botulism. If waterfowl ingest the maggots they succumb to the toxin and die and the cycle is perpetuated. This cycle creates a serious concern among the managers at Rice Lake, especially when waterfowl numbers are high and concentrated at the marsh. To reduce the potential for fish kills and improve the overall fisheries resource at Rice Lake, it is proposed to connect the Rice Lake marsh with the Duck Island gravel pits with two large diameter culverts that will allow fish to move between the two locations. Both winter and summer conditions will be improved for fish which should decrease the incidence of both fish kills and outbreaks of avian botulism.

Additional habitat improvements at Rice Lake will be accomplished by direct land use changes to increase the diversity of habitat types in the area. Converting a portion of the intensively farmed cropland on Duck Island to grassland and upland hardwoods is proposed. Three hundred of the 600 acres of cropland will be converted to a mixture of grassland (200 acres) and upland hardwoods (100 acres). Species diversity, both game and nongame, will be increased dramatically by creating this triad of upland habitats. In addition, the upland grasslands will provide critical nesting habitat for resident waterfowl that remain in the area. Portions of the grassland or cropland can be rotated with a cool season mixture to provide green browse for resident goose populations.

CONCLUSIONS AND RECOMMENDATIONS

The Rice Lake HREP offers a multi-faceted opportunity to protect and enhance a floodplain wetland community, improve a limited fishery resource, and restore upland grassland and hardwood communities under the umbrella of one HREP project. In addition, the proposed HREP will contribute directly to achieving the goals of the North American Waterfowl

Management Plan (an international, inter-agency plan to increase waterfowl populations),and the goals of the Partners for Flight program to protect and increase the habitats for neotropical migrants.

First and foremost, the successful management of the Rice Lake area for migratory birds is dependent on the production of a reliable food source seasonally. With the current level of dike and water level control capabilities, this success is greatly limited (about 1 in 5 years). Improvements to the dike system and water control capabilities will increase the reliability of annual food production to about 7 out of 10 years.

A decline in the incidence of avian botulism and an improved fishery resource will result by creating a deep water refuge for fish in the Duck Island gravel pits.

Furthermore, habitat improvements in the uplands consist of converting cropland to grasslands and replanting hardwood trees. A larger diversity of species will be able to utilize the Rice Lake area with the restoration of these two habitat types which are currently not found on the Rice Lake project area.

Therefore we recommend:

1. The perimeter dike improvements, spillway and gated outlets be constructed to protect the marsh and increase the reliability of food production for migrating waterfowl and shorebirds.

2. The new pump station facilities be constructed to improve water level control and increase the acreage of aquatic and nonforested wetland habitats.

3. The link between Rice Lake and Duck Island be constructed to create a fisheries refuge.

4. The habitat diversity of the complex be increased through the restoration of 200 acres of grasslands and 100 acres of upland hardwoods in an existing crop field.

We appreciate the opportunity to provide these comments and look forward to continued coordination. If you have any questions, please contact Mr. Joe Slater of my staff at (309) 793-5800 ext. 523.

Sincerely,

Wayne A. Fischer

fa Richard C. Nelson
Supervisor

CLEAN WATER ACT
SECTION 404 (b)(1) EVALUATION

A P P E N D I X B

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17D)

RICE LAKE STATE FISH AND WILDLIFE AREA
HABITAT REHABILITATION AND ENHANCEMENT

LA GRANGE POOL, ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

APPENDIX B
CLEAN WATER ACT
SECTION 404(b)(1) EVALUATION

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APPENDIX B
CLEAN WATER ACT
SECTION 404(b)(1) EVALUATION

SECTION 1 - PROJECT DESCRIPTION

LOCATION

The proposed project is located on the right descending bank of the Illinois River (River Miles 132.0 - 138.0) in Fulton County, Illinois. The Rice Lake State Fish and Wildlife Area was purchased by the Illinois Department of Natural Resources for the purpose of providing consumptive and nonconsumptive enjoyment of fish, wildlife, and natural habitats. The area comprises approximately 5,600 acres of primarily backwater lakes and floodplain forest. (See plates 1 and 2 of the Definite Project Report (DPR).)

GENERAL DESCRIPTION

By definition and Federal regulatory jurisdiction, much of the site is classified as wetland or as "waters of the United States" and is therefore subject to evaluation and regulation under Section 404 of the Clean Water Act.

The Rice Lake Habitat Rehabilitation and Enhancement Project is a proposed project to enhance wetland, aquatic and terrestrial habitats by increasing the success rate for emergent and moist-soil vegetation, increasing food and cover for wildlife, and providing access to deepwater areas for fish. Measures to accomplish these objectives will include construction of a perimeter water control dike, spillway structure, and gated culvert on the eastern side of the project area; increasing water level management capability through construction of a new pump station and associated interior conveyance ditches; construction of a fish passage structure between Rice Lake and deepwater areas of the Duck Island gravel pit; and planting warm season grasses and mast producing tree species on a portion of the cropfields on Duck Island.

AUTHORITY AND PURPOSE

The authority for this action is provided by the 1985 Supplemental Appropriations Act (Public Law 99-88) and Section 1103 of the Water Resources Development Act of 1986 (Public Law 99-662). Section 1103 is summarized in the DPR.

The purpose of this project, under Section 1103, is "to ensure the coordinated development and enhancement of the Upper Mississippi River (UMR)." The project is the result of planning efforts by the State of Illinois, the U.S. Fish and Wildlife Service, and the U.S. Army Corps of Engineers.

GENERAL DESCRIPTION OF DREDGED AND FILL MATERIAL

Perimeter water control dike construction will require approximately 50,000 cubic yards of sand hydraulically dredged from the Illinois River. This material will be obtained from a nearby reach of the navigation channel that has required frequent dredging in the recent past. Dredged sand will be temporarily stockpiled along the shoreline of Goose Lake. The alignment of the water control dike will be stripped of topsoil prior to placement of the stockpiled sand. Following placement and shaping of the sand material, the dike structure will be capped with the stripped topsoil material and reseeded. Approximately 253,000 cubic yards of earthen material will be excavated to construct conveyance ditches and structures associated with pump station development. Material excavated from the conveyance ditches associated with pump station development will be placed on the adjacent bankline or used to rehabilitate existing dike structures in the smaller management units. Material excavated for construction of the pump station (approximately 500 cubic yards) and fish passage structures (approximately 2,200 cubic yards) will be placed in a non-wetland area. Soils in the construction area are primarily of the Lawson-Sawmill association and are deep, moderately permeable, somewhat poor to poorly drained and vary from alkaline to neutral.

DESCRIPTION OF PROPOSED PLACEMENT SITES

Construction of the perimeter water control dike, pumping facilities and conveyance ditches will involve placement of dredged and fill material on areas currently covered by herbaceous and woody vegetation. Placement sites will be allowed to revegetate naturally, reseeded to grass, or riprapped (the spillway structure).

Construction activities are anticipated to last at least one construction season (May through October). If bad weather, high water, or other circumstances arise, construction will carry on to the next season.

Transportation of borrow material will be primarily on existing roadways or other disturbed areas. Any temporary haul roads or stockpile areas built in wetlands will be degraded to original contour once the project is completed.

Planting of warm season grasses and mast trees on the Duck Island peninsula will take place in areas not identified as jurisdictional wetland. Consequently, this activity is not addressed in detail in this evaluation.

DESCRIPTION OF THE PLACEMENT METHOD

Sand for the perimeter dike structure will be hydraulically dredged from the Illinois River and pumped to a temporary stockpile site adjacent to the construction area. Topsoil material will be excavated and stockpiled by mechanical means, using belly scrapers and backhoes. Stockpiled materials will be graded and shaped using bulldozers and other mechanical means during dike construction. Following construction, the stockpile area will be regraded to the original contours.

The pump station will require a concrete pad, as well as construction of inlet and discharge pipes. The conveyance ditches will be excavated by mechanical means. The fish egress structure will involve construction of a 60-inch-diameter culvert through a causeway that separates Rice Lake from the Duck Island gravel pit.

SECTION 2 - FACTUAL DETERMINATIONS

PHYSICAL SUBSTRATE DETERMINATIONS

Terrestrial borrow materials are bottomland soils of the Lawson-Sawmill association. These soils are dark or moderately dark colored and are of alluvium origin. For the most part, aquatic substrates would be affected incidentally to adjacent construction activities. Aquatic substrates would be directly affected by hydraulic dredging. Substrate materials to be dredged would consist of medium to fine sand with little or no organic content. These substrates would eventually be covered with material of similar character. Recolonization of benthic organisms should occur quickly.

WATER CIRCULATION, FLUCTUATION, AND SALINITY DETERMINATIONS

a. Water. Construction activities would increase turbidity in adjacent water bodies in the short term. No long-term impacts in turbidity levels are anticipated. No significant differences in water chemistry are expected following project construction. Short-term rises in turbidity may occur, but should not have a detrimental effect on water quality or plant and animal life.

b. Current Patterns and Water Circulation. No significant effects to existing current patterns or water circulation are expected to result from this action.

c. Normal Water Level Fluctuation. Fluctuations in the adjacent Illinois River system, both daily and seasonal, depend on discharge changes, lock and dam operations, and seasonal weather patterns. Project implementation is not expected to affect normal river stages or flood heights. The relatively low height of the water control dike ensures that the structure will be overtopped at the spillway on an annual basis, and will overtop along its length in at least 50 percent of the years throughout the life of the project.

Proposed water control operations call for a 1- to 2-foot fluctuation on both Rice Lake and Big Lake for wildlife management purposes, primarily in summer and fall. The managed water level fluctuations are anticipated to vary from without-project conditions in timing but not in scope; in fact, it is expected that interior water level fluctuations will be more predictable, more gradual and possibly less extreme under with-project conditions.

d. Salinity Gradient. This consideration is not applicable in the location of the proposed project.

e. Actions Taken to Minimize Impacts. The water control dike alignment was designed to take advantage of existing roadways and high ground paralleling the Illinois river, to minimize the size of the placement area and the quantity of fill material required for project construction. Excavation of conveyance ditches for additional water control facilities will primarily involve work in existing ditches and other previously disturbed areas. The use of on-site borrow material and material dredged from a chronic shoaling area of the Illinois River is intended to minimize impacts to the aquatic system.

SUSPENDED PARTICULATE/TURBIDITY DETERMINATIONS

a. Effects on Physical and Chemical Properties of the Water Column. Some minor, short-term increases in suspended particulates and turbidity levels could occur in the immediate vicinity of construction activities. These effects would be limited in both scope and duration.

b. Effects on Biota. Minor disturbances to organisms present in the construction zone could occur as a result of fill activity. No long-term adverse effects to biota would be anticipated to result from this action. The overall impact of the HREP project is expected to be beneficial to biota in the project area and the river system.

c. Actions Taken to Minimize Impacts. See paragraph (e) above.

CONTAMINANT DETERMINATIONS

Construction activities are not expected to increase total suspended solids or to change pH or dissolved oxygen levels. Any contaminants introduced into the Rice Lake State Fish and Wildlife Area or adjacent river systems are not expected to differ from those ordinarily found in these systems. The sandy material to be dredged is of large enough particle size so that contaminant binding is negligible. Historically, sediment sampling of sandy dredged material has shown an insignificantly low level of contamination, since contaminants have a greater affinity for smaller-sized particles.

Possible introduction of equipment or construction-related contaminants would be controlled by adherence to runoff monitoring plans during construction activity. No toxic materials would be introduced to the area as a result of construction activities. Appropriate measures, such as hay bales or silt fences, would be implemented to control stormwater discharge. Should any such discharges occur, they would be contained on site.

These measures are designed to constitute compliance with point source discharge (Section 402) requirements of the Clean Water Act. A complete stormwater pollution prevention plan is found in paragraph 10.c. of the main report.

AQUATIC ECOSYSTEM AND ORGANISM DETERMINATIONS

a. Effects on Plankton and Nekton. Only short-term and minimal effects are anticipated to occur as a result of dredging. No significant impacts to either plankton or nekton are expected.

b. Effects on Benthos. (See "Physical Substrate Determinations, d. Physical Effects on Benthos.") No significant impacts to benthos either at the location of hydraulic dredging or at the placement site is anticipated.

c. Effects on Aquatic Food Web. Only short-term and minimal impacts would be expected to occur during the construction period. No long-term adverse effects to the aquatic food web are anticipated to result from this action.

d. Effects on Special Aquatic Sites. No vegetated shallows, coral reefs, or riffle and pool complexes are present in the project area. No adverse impacts to mudflats are anticipated. The proposed action is expected to have an overall beneficial effect on wetland wildlife, wetland functions and values, and sanctuaries and refuges. Project planning considered to the full extent the minimization of wetland loss, and it is intended that wetland values would be improved as a result of project implementation.

e. Threatened and Endangered Species. Correspondence from the U.S. Fish and Wildlife Service (Appendix A) indicates that no impacts are envisioned to threatened or endangered species or their habitats, provided that construction activities are scheduled and monitored to avoid direct impacts to these species.

f. Other Wildlife. Wildlife species which utilize nonforested wetland habitats should benefit in the long term from the proposed action. Species which utilize forested wetlands should not be significantly affected by the removal of 10 acres of trees from the water control dike alignment.

g. Actions Taken to Minimize Impacts. See paragraph (e) under "Water Circulation, Fluctuation, and Salinity Determinations."

PROPOSED PLACEMENT SITE DETERMINATIONS

a. Mixing Zone Determinations. Discussions pertaining to turbidity and suspended particulates are summarized under "Effects on Physical and Chemical Properties of the Water Column." Contaminants were discussed previously under "Contaminant Determinations." The large capacity of the navigation channel should provide an adequate mixing zone for any contaminated sediments that may be present. As mentioned earlier, most contaminants have affinities for finer sediments than are found at either the dredge cut or the placement location.

b. Determination of Compliance with Applicable Water Quality Standards. An application for State water quality certification under Section 401 of the Clean Water Act is being submitted to the Illinois Department of Natural Resources, Office of Water Resources.

c. Potential Effects on Human-Use Characteristics. Implementation of the proposed project will have no significant adverse effects on municipal or private water supplies; recreational or commercial fisheries; water related recreation or aesthetics; parks; national monuments; or other similar preserves. Any impacts will be minimal and of short-term duration.

DETERMINATION OF CUMULATIVE EFFECTS ON THE AQUATIC ECOSYSTEM

The project would have positive benefits to aquatic resources found on the site. Temporary turbidity impacts may occur on and off site, but would be short-term in duration. No cumulative negative impacts are anticipated to occur. Beneficial impacts are expected to occur on site for wetlands, wetland wildlife, and fish. Long-term productivity would be enhanced with the habitat improvements that are proposed.

DETERMINATION OF SECONDARY EFFECTS ON THE AQUATIC ECOSYSTEM

The existing rate of sediment deposition in the project area is not expected to change significantly as a result of project implementation. Although material would be pushed into some of the water bodies, this would not significantly contribute to degradation of these waters. Creatures utilizing these water bodies should benefit from the physical conditions that the structure would create when managed to meet site objectives.

SECTION 3 - FINDINGS OF COMPLIANCE OR NONCOMPLIANCE WITH THE RESTRICTIONS ON PLACEMENT

1. No significant adaptations of the Section 404(b)(1) guidelines were made relative to this evaluation.

2. Alternatives which were considered for the proposed action were as follows:

Alternative A - No Federal Action

Alternative B - Preferred Alternative.

Alternative C - Management features considered but not selected.

3. Certification under Section 401 of the Clean Water Act will be obtained from the Illinois Department of Natural Resources and will be included in the final version of this report. The project will therefore be in compliance with the water quality requirements of the State of Illinois.

4. The project will not introduce toxic substances into nearby waters or result in appreciable increases in existing levels of toxic materials.

5. No significant impact to federally listed endangered species will result from this project. This determination is supported by the U.S. Fish and Wildlife Service, Ecological Services Office, Rock Island, Illinois.

6. The project is located along a freshwater inland river system. No marine sanctuaries are involved or will be affected.

7. No municipal or private water supplies will be affected. There will be no adverse impact to recreational fishing, and no unique or special aquatic sites are located in the project area. No long-term adverse changes to the ecology of the river system will result from this action.

8. Project construction materials will be chemically and physically stable. No contamination of the river is anticipated.

9. No other practical alternatives have been identified. The proposed project is in compliance with the guidelines for Section 404(b)(1) of the Clean Water Act, as amended. The proposed project will not significantly impact water quality or the integrity of the aquatic ecosystem.

10. On the basis of the guidelines, the proposed placement site for the discharge of dredged material is specified as complying with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects to the aquatic ecosystem.

____________________ Date	James V. Mudd Colonel, U.S. Army District Engineer

DRAFT PROJECT COOPERATION AGREEMENT

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PROJECT COOPERATION AGREEMENT BETWEEN THE DEPARTMENT OF THE ARMY AND THE STATE OF ILLINOIS FOR CONSTRUCTION OF THE RICE LAKE STATE FISH AND WILDLIFE HABITAT REHABILITATION AND ENHANCEMENT PROJECT IN FULTON COUNTY, ILLINOIS

THIS AGREEMENT is entered into this _____________ day of ___________, 199__, by and between the **DEPARTMENT OF THE ARMY** (hereinafter the "Government"), represented by U.S. Army Engineer for the Rock Island District (hereinafter the "District Engineer"), and **THE STATE OF ILLINOIS DEPARTMENT OF NATURAL *RESOURCES*** *(hereinafter the "State")*, represented by the Director, Illinois Department of Natural Resources.

WITNESSETH, THAT:

WHEREAS, construction of the Habitat Rehabilitation and Enhancement Project, at Rice Lake State Fish and Wildlife Area in Fulton County, Illinois was approved under the terms of the Upper Mississippi River System Environmental Management Program, as authorized by Section 1103(e) of the Water Resources Development Act of 1986, Public Law 99-662, as amended;

WHEREAS, the Government and the State desire to enter into a Project Cooperation Agreement for construction of the Rice Lake State Fish and Wildlife Area Habitat Rehabilitation and Enhancement Project (hereinafter the "Project", as defined in Article I.A. of this Agreement);

WHEREAS, Section 906(e) of Public Law 99-662 provides that the first costs for enhancement of fish and wildlife resources shall be a Federal cost when certain specified circumstances are present;

WHEREAS, Section 906(e) further provides that when such specified circumstances are not present, 25 percent of the first cost of enhancement of fish and wildlife resources shall be provided by the Non-Federal Interest;

WHEREAS, the Government and the State agree that the specified circumstances referred to in Subsection 906(e) of Public Law 99-662 are not present for the project;

WHEREAS, Section 1103(e)(7)(a) of the Water Resources Development Act of 1986, Public Law 99-662, as amended by Section 107(b) of the Water Resources Development Act of 1992, Public Law 102-580, specifies the operation and maintenance responsibilities for the Project;

WHEREAS, Section 221 of the Flood Control Act of 1970, Public Law 91-611, as amended, provided that the Secretary of that Army shall not commence construction of any water resources project, or separable element thereof, until each non-federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

WHEREAS, Section 1103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, establishes the maximum amount of costs for the habitat rehabilitation and enhancement component of the Upper Mississippi River System Environmental Management Program;

WHEREAS, the Government and the State have the full authority and capability to perform as hereinafter set forth and intend to cooperate in cost-sharing and financing of the construction of the Project in accordance with the terms of this Agreement.

NOW, THEREFORE, the Government and the State agree as follows:

ARTICLE I - DEFINITIONS AND GENERAL PROVISIONS

For purposes of this Agreement:

A. The term "Project" shall mean the improvement of the Hate levee to function as the major water control facility for the entire complex; location and construction of a pumping facility on the Illinois Waterway; excavation of channels for water supply to management areas; upgrading of the riverside access road/levee for flood and sediment control; interior levees for moist soil management; and mast tree and grass plantings on Duck Island, all as generally described in the Upper Mississippi River System Environmental Management Program Definite Project Report With Integrated Environmental Assessment Rice Lake State Fish and Wildlife Area, LaGrange Pool, Illinois Waterway, Fulton County, Illinois, dated ____________ 199_, and approved by the Assistant Secretary Of The Army, (Civil Works), on __ _________ 199_.

B. The term "total project costs" shall mean all costs incurred by the State and the Government in accordance with the terms of this Agreement directly related to construction of the Project. Subject to the provisions of this Agreement, the term shall include, but is not necessarily limited to: continuing planning and engineering costs incurred after October 1, 1985; advanced engineering and design costs; preconstruction engineering and design costs; engineering and design costs during construction; the costs of investigations to identify the existence and extent of hazardous substances in accordance with Article XV.A. of this Agreement; costs of historic preservation activities in accordance with Article XVIII.A. of this Agreement; actual construction costs; supervision and administration costs; costs of participation in the Project Coordination Team in accordance with Article V of this Agreement; costs of contract dispute settlements or awards; the value of lands, easements, right-of-way, relocation, and suitable borrow and dredged or excavated material disposal areas for which the Government affords credit in accordance with Article IV of this Agreement; and costs of audit in accordance with Article X of this Agreement. The term does not include any costs for operation, maintenance, repair, replacement, or rehabilitation; any costs due to betterments; or any costs of dispute resolution under Article VII of this Agreement

C. The term "financial obligation for construction" shall mean a financial obligation of the Government, other than an obligation pertaining to the provision of lands, easements, rights-of-way, relocations, and borrow and dredged or excavated material disposal areas, that results or would result in a cost that is or would be included in total project costs.

D. The term "non-Federal proportionate share" shall mean the ratio of the State's total cash contribution required in accordance with Articles II.D.1. and II.D.2. of this Agreement to total financial obligations for construction, as projected by the Government.

E. The term "period of construction" shall mean the time from the date the Government first notifies the State in writing, in accordance with Article VI.B. of this Agreement, of the scheduled date for issuance of the solicitation for the first construction contract to the date that the U.S. Army Engineer for the Rock Island District (hereinafter the "District Engineer") notifies the State in writing of the Government's determination that construction of the Project is complete.

F. The term "highway" shall mean any public highway, roadway, street, or way, including any bridge thereof.

G. The term "relocation" shall mean providing a functionally equivalent facility to the owner of an existing utility, cemetery, highway or other public facility, or railroad when such action is authorized in accordance with applicable legal principles of just compensation or as otherwise provided in the authorizing legislation for the Project or any report referenced therein. Providing a functionally equivalent facility may take the form of alteration, lowering, raising, or replacement and attendant removal of the affected facility or part thereof.

H. The term "fiscal year" shall mean one fiscal year of the Government. The Government fiscal year begins on October 1 and ends on September 30.

I. The term "functional portion of the Project" shall mean a portion of the Project that is suitable for tender to the State to operate and maintain in advance of completion of the entire Project. For a portion of the Project to be suitable for tender, the District Engineer must notify the State in writing of the Government's determination that the portion of the Project is complete and can function independently and for a useful purpose, although the balance of the Project is not complete.

J. The term "betterment" shall mean a change in the design and construction of an element of the Project resulting from the application of standards that the Government determines exceed those that the Government would otherwise apply for accomplishing the design and construction of that element.

ARTICLE II - OBLIGATIONS OF THE GOVERNMENT AND THE STATE

A. The Government, subject to receiving funds appropriated by the Congress of the United States (hereinafter, the "Congress") and using those funds and funds provided by the State, shall expeditiously construct the Project, applying those procedures usually applied to Federal projects, pursuant to Federal laws, regulations, and policies, except that the State shall accomplish the proposed work.

1. The Government shall afford the State the opportunity to review and comment on the solicitations for all contracts, including relevant plans and specifications, prior to the Government's issuance of such solicitations. The Government shall not issue the solicitation for the first construction contract until the State has confirmed in writing its willingness to proceed with the Project. To the extent possible, the Government shall afford the State the opportunity to review and comment on all contract modifications, including change orders, prior to the issuance to the contractor of a Notice to Proceed. In any instance where providing the State with notification of a contract modification or change order is not possible prior to issuance of the Notice to Proceed, the Government shall provide such notification in writing at the earliest date possible. To the extent possible, the Government also shall afford the State the opportunity to review and comment on all contract claims prior to resolution thereof. The Government shall consider in good faith the comments of the State, but the contents of solicitations, award of contracts, execution of contract modifications, issuance of change orders, resolution of contract claims, and performance of all work on the Project (whether the work is performed under contract or by Government personnel), shall be exclusively within the control of the Government.

2. *Throughout the period of construction, the District* Engineer shall furnish the State with a copy of the Government's Written Notice of Acceptance of Completed Work for each contract for the Project.

B. The State may request the Government to accomplish betterments. Such requests shall be in writing and shall describe the betterments requested to be accomplished. If the Government in its sole discretion elects to accomplish the requested betterments or any portion thereof, it shall so notify the State in a writing that sets forth any applicable terms and conditions, which must be consistent with this Agreement. In the event of conflict between such a writing and this Agreement, this Agreement shall control. The State shall be solely responsible for all costs due to the requested betterments and shall pay all such costs in accordance with Article VI.C. of this Agreement.

C. When the District Engineer determines that the entire Project is complete or that a portion of the Project has become a functional portion of the Project, the District Engineer shall so notify the State in writing and furnish the State with an Operation and Maintenance Manual (hereinafter the "O&M Manual") and with copies of all of the Government's Written Notices of Acceptance of Completed Work for all contracts for the Project or the functional portion of the Project that have not been provided previously. Upon such notification, the State shall operate and maintain the entire Project or the functional portion of the Project in accordance with Article VIII of this Agreement.

D. The State shall contribute 25 percent of total project costs in accordance with the provisions of this paragraph.

1. In accordance with Article III of this Agreement, the State shall provide all lands, easements, rights-of-way, and suitable borrow and dredged or excavated material disposal areas that the Government determines the State must provide for the construction, operation, and maintenance of the Project and shall perform or ensure performance of all relocations that the Government determines to be necessary for the construction, operation, and maintenance of the Project.

2. If the Government projects that the value of the State's contributions under paragraph D.1 of this Article and Articles V, X, and XV.A. of this Agreement will be less than 25 percent of total project costs, the State shall provide an additional cash contribution, in accordance with Article VI.B. of this Agreement, in the amount necessary to make the State's total contribution equal to 25 percent of total project costs.

3. If the Government determines that the value of the State's contributions provided under paragraphs D.1. and D.2. of this Article and Articles V, X, and XV.A. of this Agreement has exceeded 25 percent of total project costs, the Government, subject to the availability of funds, shall reimburse the State for any such value in excess of 25 percent of total project costs. After such a determination, the Government, in its sole discretion, may provide any remaining Project lands, easements, rights-of-way, and suitable borrow and dredged or excavated material disposal areas and perform any remaining project relocations on behalf of the State.

E. The State may request the Government to provide lands, easements, rights-of-way, and suitable borrow and dredged or excavated material disposal areas or perform relocations on behalf of the State. Such requests shall be in writing and shall describe the services requested to be performed. If in its sole discretion the Government elects to perform the requested services or any portion thereof, it shall so notify the State in a writing that sets forth any applicable terms and conditions, which must be consistent with this Agreement. In the event of conflict between such a writing and this Agreement, this Agreement shall control. The State shall be solely responsible for all costs of the requested services and shall pay all such costs in accordance with Article VI.C. of this Agreement. Notwithstanding the provision of lands, easements, rights-of-way, and suitable borrow and dredged or excavated material disposal areas or performance of relocations by the Government, the State shall be responsible, as between the Government and the State, for the costs of cleanup and response in accordance with Article XV.C. of this Agreement.

F. The Government shall perform a final accounting in accordance with Article VI.D. of this Agreement to determine the contributions provided by the State in accordance with paragraphs B., D., and E. of this Article and Articles V, X, and XV.A. of this Agreement and to determine whether the State has met its obligations under paragraphs B., D., and E. of this Article.

G. The State shall not use Federal funds to meet the *State's share of total project costs under this Agreement unless* the Federal granting agency verifies in writing that the expenditure of such funds is expressly authorized by statute.

ARTICLE III - LANDS, RELOCATIONS, DISPOSAL AREAS, AND PUBLIC LAW 91-646 COMPLIANCE

A. The Government, after consultation with the State, shall determine the lands, easements, and rights-of-way required for the construction, operation, and maintenance of the Project, including those required for relocations, borrow materials, and dredged or excavated material disposal. The Government in a timely manner shall provide the State with general written descriptions, including maps as appropriate, of the lands, easements, and rights-of-way that the Government determines the State must provide, in detail sufficient to enable the State to fulfill its obligations under this paragraph, and shall provide the State with a written notice to proceed with acquisition of such lands, easements, and rights-of-way. Prior to the end of the period of construction, the State shall acquire all lands, easements, and rights-of-way set forth in such descriptions. Furthermore, prior to issuance of the solicitation for each construction contract, the State shall provide the Government with authorization for entry to all lands, easements, and rights-of-way the Government determines the State must provide for that contract. For so long as the Project remains authorized, the State shall ensure that lands, easements, and rights-of-way that the Government determines to be required for the operation and maintenance of the Project and that were provided by the State are retained in public ownership for uses compatible with the authorized purposes of the Project.

B. The Government, after consultation with the State, shall determine the improvements required on lands, easements, and rights-of-way to enable the proper disposal of dredged or excavated material associated with the construction, operation, and maintenance of the Project. Such improvements may include, but are not necessarily limited to, retaining dikes, wasteweirs, bulkheads, embankments, monitoring features, stilling basins, and de-watering pumps and pipes. The Government in a timely manner shall provide the State with general written descriptions of such improvements in detail sufficient to enable the State to fulfill its obligations under this paragraph, and shall provide the State with a written notice to proceed with construction of such improvements. Prior to the end of the period of construction, the State shall provide all improvements set forth in such descriptions. Furthermore, prior to issuance of the solicitation for each Government construction contract, the State shall prepare, or insure the preparation of, plans and specifications for all improvements the Government determines to be required for the proper disposal of dredged or excavated material under that contract, submit such plans and specifications to the Government for approval, and provide such improvements in accordance with the approved plans and specifications.

C. The Government, after consultation with the State, shall determine the relocations necessary for the construction, operation, and maintenance of the Project, including those necessary to enable the removal of borrow materials and the proper disposal of dredged or excavated material. The Government in a timely manner shall provide the State with general written descriptions, including maps as appropriate, of such relocations in detail sufficient to enable the State to fulfill its obligations under this paragraph, and shall provide the State with a written notice to proceed with such relocations. Prior to the end of the period of construction, the State shall perform or ensure the performance of all relocations as set forth in such descriptions. Furthermore, prior to issuance of the solicitation for each Government construction contract, the State shall prepare or ensure the preparation of plans and specifications for, and perform or ensure the performance of, all relocations the Government determines to be necessary for that contract.

D. The State in a timely manner shall provide the Government with such documents as are sufficient to enable the Government to determine the value of any contribution provided pursuant to paragraphs A., B., or C. of this Article. Upon receipt of such documents the Government, in accordance with Article IV of this Agreement and in a timely manner, shall determine the value of such contribution, include such value in total project costs, and afford credit for such value toward the State's share of total project costs.

E. The State shall comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 C.F.R. Part 24, in acquiring lands, easements, and rights-of-way required for the construction, operation, and maintenance of the Project, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, and shall inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.

ARTICLE IV - CREDIT FOR VALUE OF LANDS, RELOCATIONS, AND IMPROVEMENTS OF DISPOSAL AREAS

A. The State shall receive credit toward it's share of total project costs for the value of the lands, easements, rights-of-way, and suitable borrow and dredged or excavated material disposal areas that the State must provide pursuant to Article III of this Agreement, and for the value of the relocations, that the State must perform or for which it must ensure performance pursuant to Article III of this Agreement. However, the State shall not receive credit for the value of any lands, easements, rights-of-way, relocations, or borrow and dredged or excavated material disposal areas that have been provided previously as an item of cooperation for another Federal project, or that are owned by the State on the effective date of this agreement. The State also shall not receive credit for the value of lands, easements, rights-of-way, relocations, or borrow and dredged or excavated material disposal areas to the extent that such items are provided using Federal funds unless the Federal granting agency verifies in writing that such credit is expressly authorized by statute.

B. For the sole purpose of affording credit in accordance with this Agreement, the value of lands, easements, and rights-of-way, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, shall be fair market value of the real property interests, plus certain incidental costs of acquiring those interests, as determined in accordance with the provisions of this paragraph.

1. Date of Valuation. The fair market value of lands, easements, or rights-of-way owned by the State on the effective date of this Agreement shall be fair market value of such real property interests as of the date the State provides the Government with authorization for entry thereto. The fair market value of lands, easements, or rights-of-way acquired by the State after the effective date of this Agreement shall be the fair market value of such real property interests at the time the interests are acquired.

2. General Valuation Procedure. Except as provided in paragraph B.3. of this Article, the fair market value of lands, easements, or rights-of-way shall be determined in accordance with paragraph B.2.a. of this Article, unless thereafter a

different amount is determined to represent fair market value in accordance with paragraph B.2.b. of this Article.

a. The State shall obtain, for each real property interest, an appraisal that is prepared by a qualified appraiser who is acceptable to the State and the Government. The appraisal must be prepared in accordance with the applicable rules of just compensation, as specified by the Government. The fair market value shall be the amount set forth in the State's appraisal, if such appraisal is approved by the Government. In the event the Government does not approve the State's appraisal, the State may obtain a second appraisal and the fair market value shall be the amount set forth in the State's second appraisal, if such appraisal is approved by the Government. In the event the Government does not approve the State's second appraisal, or the State chooses not to obtain a second appraisal, the Government shall obtain an appraisal and the fair market value shall be the amount set forth in the Government's appraisal, if such appraisal is approved by the State. In the event the State does not approve the Government's appraisal, the Government, after consultation with the State shall consider the Government's and the State's appraisal and determine an amount based thereon, which shall be deemed to be the fair market value.

b. Where the amount paid or proposed to be paid by the State for the real property interest exceeds the amount determined pursuant to paragraph B.2.a. of this Article, the Government, at the request of the State, shall consider all factors relevant to determining fair market value and, in its sole discretion, after consultation with the State, may approve in writing an amount greater than the amount determined pursuant to paragraph B.2.a. Article, but not to exceed the amount actually paid or proposed to be paid. If the Government approves such an amount, the market value shall be the lesser of the approved amount or the amount paid by the State, but not less than the amount determined pursuant to paragraph B.2.a. of this Article.

3. Eminent Domain Valuation Procedure. For lands, easements, or rights-of-way acquired by eminent domain proceedings instituted after the effective date of this Agreement, the State shall, prior to instituting such proceedings, submit to the Government notification in writing of its intent to institute such proceedings and an appraisal of the specific real property interest to be acquired in such

proceedings. The Government shall have 60 days after receipt of such notice and appraisal within which to review the appraisal, if not previously approved by the Government in writing.

a. If the Government previously has approved the appraisal in writing, or if the Government provides written approval of, or takes no action on, the appraisal within such 60-day period, the appraisal shall be considered approved and the State shall use the amount set forth in such appraisal as the estimate of just compensation for the purpose of instituting the eminent domain proceeding.

b. If the Government provides written disapproval of the appraisal, including the reasons for the disapproval, within such 60-day period, the Government and the State shall consult in good faith to promptly resolve the issues or areas of disagreement that are identified in the Government's written disapproval. If, after such good faith consultation, the Government and the State agree as to an appropriate amount, then the State shall use that amount as the estimate of just compensation for the purpose of instituting the eminent domain proceeding. If, after such good faith consultation, the Government and the State cannot agree as to an appropriate amount, then the State may use the amount set forth in its appraisal as the estimate of just compensation for the purpose of instituting the eminent domain proceeding.

c. For lands, easements, or rights-of-way acquired by eminent domain proceedings instituted in accordance with sub-paragraph B.3. of this Article, fair market value shall be either the amount of the court award for the real property interests taken, to the extent the Government determined such interests are required for the construction , operation, and maintenance of the project, or the amount of any stipulated settlement or portion thereof that the Government approves in writing.

4. Incidental Costs. For lands, easements, or rights-of-way acquired by the State within a five-year period preceding the effective date of this Agreement, or at any time after the effective date of this Agreement, the value of the interest shall include the documented incidental costs of acquiring the interest as determined by the Government, subject to an audit in accordance with Article X.C. of this Agreement to determine reasonableness, allocability, and allowability of costs. Such incidental costs shall include, but not necessarily be limited

to, closing and title costs, appraisal costs, survey costs, attorney's fees, plat maps, and mapping costs, as well as the actual amounts expended for payment of any Public Law 91-646 relocation assistance benefits provided in accordance with Article III.E. of this Agreement.

C. After consultation with the State, the Government shall determine the value of relocation in accordance with the provisions of this paragraph.

1. For a relocation other than a highway, the value shall be only that portion of relocation costs that the Government determines is necessary to provide a functionally equivalent facility, reduced by depreciation, as applicable and by the salvage value of any removed items.

2. For a relocation of a highway, the value shall be only that portion of relocation costs that would be necessary to accomplish the relocation in accordance with the design standard that the State of Illinois would apply under similar conditions of geography and traffic load, reduced by the salvage value of any removed items.

3. Relocation costs shall include, but not necessarily be limited to, actual costs of performing the relocation; planning, engineering and design costs; supervision and administration costs; and documented incidental costs associated with performance of the relocation, but shall not include costs due to betterments, as determined by the Government, nor any additional cost of using new material when suitable used material is available. Relocation costs shall be subject to an audit in accordance with Article X.C. of this Agreement to determine reasonableness, allocability, and allowability of costs.

D. The value of the improvements made to lands, easements, and rights-of-way for the proper disposal of dredged or excavated material shall be the costs of the improvements, as determined by the Government, subject to an audit in accordance with Article X.C. of this Agreement to determine reasonableness, allocability, and allowability of costs. Such costs shall include, but not necessarily be limited to, actual costs of providing the improvements; planning, engineering and design costs; supervision and administration costs; and documented incidental costs associated with providing the improvements, but shall not include any costs due to betterments, as determined by the Government.

ARTICLE V - PROJECT COORDINATION TEAM

A. To provide for consistent and effective communication, the State and the Government, not later than 30 days after the effective date of this Agreement, shall appoint named senior representatives to a Project Coordination Team. Thereafter, the Project Coordination Team shall meet regularly until the end of the period of construction. The Government's Project Manager and a counterpart named by the State shall co-chair the Project Coordination Team.

B. The Government's Project Manager and the State's counterpart shall keep the Project Coordination Team informed of the progress of construction and of significant pending issues and actions, and shall seek the views of the Project Coordination Team on matters that the Project Coordination Team generally oversees.

C. Until the end of the period of construction, the Project Coordination Team shall generally oversee the Project, including issues related to design; plans and specifications; scheduling; real property and relocation requirements; real property acquisition; contract awards and modifications; contract costs; the Government's cost projections; final inspection of the entire Project or functional portions of the Project; preparation of the proposed O&M Manual; anticipated requirements and needed capabilities for performance of operation, maintenance, repair, replacement, and rehabilitation of the Project; and other related matters. This oversight shall be consistent with a project management plan developed by the Government after consultation with the State.

D. The Project Coordination Team may make recommendations that it deems warranted to the District Engineer on matters that the Project Coordination Team generally oversees, including suggestions to avoid potential sources of dispute. The Government, in good faith, shall consider the recommendations of the Project Coordination Team. The Government, having the legal authority and responsibility for construction of the Project, has *the discretion to accept, reject, or modify the Project* Coordination Team's recommendations.

E. The costs of participation in the Project Coordination Team shall be included in total project costs and cost shared in accordance with the provisions of this Agreement.

ARTICLE VI - METHOD OF PAYMENT

A. The Government shall maintain current records of contributions provided by the parties and current projections of total project costs and costs due to betterments. By April 1 of each year and at least quarterly thereafter, the Government shall provide the State with a report setting forth all contributions provided to date and the current projections of total project costs, of total costs due to betterments, of the components of total project costs, of each party's share of total project costs, of the State's total cash contributions required in accordance with Articles II.B., II.D., and II.E. of this Agreement, of the non-Federal proportionate share, and of the funds the Government projects to be required from the State for the upcoming fiscal year. On the effective date of this Agreement, total project costs are projected to be $________, and the State's cash contribution required under Article II.D. of this Agreement is projected to be $________. Such amounts are estimates subject to adjustment by the Government and are not to be construed as the total financial responsibilities of the Government and the State.

B. The State shall provide the cash contribution required under Article II.D.2. of this Agreement in accordance with the provisions of this paragraph.

1. Not less than 60 calendar days prior to the scheduled date for issuance of the solicitation for the first construction contract, the Government shall notify the State in writing of such scheduled date and the funds the Government determines to be required from the State to meet the non-Federal proportionate share of projected financial obligations for construction through the first fiscal year of construction, including the non-Federal proportionate share of financial obligations for construction incurred prior to the commencement of the period of construction. Not later than such scheduled date, the State shall provide the Government with the full amount of the required funds by delivering a check payable to "FAO, USAED, Rock Island" to the District Engineer.

2. For the second and subsequent fiscal years of construction, the Government shall notify the State in writing, no later than 60 calendar days prior to the beginning of that fiscal year, of the funds the Government determines to be required from the State to meet the non-Federal proportionate share of projected financial obligations for construction for that fiscal year. The estimate of funds required from the State for the fiscal year shall reflect the Government's forecast of the credit for the proposed work, or independent portion thereof, that is scheduled to be finalized and applied during that fiscal year. No later than 30 calendar days prior to the beginning of the fiscal year, the State shall make the full amount of the required funds for that fiscal year available to the Government through the funding mechanism specified in Article VI.B.1. of this Agreement.

3. The Government shall draw from the funds provided by the State such sums as the Government deems necessary to cover: (a) the non-Federal proportionate share of financial obligations for construction incurred prior to the commencement of the period of construction; and (b) the non-Federal proportionate share of financial obligations for construction as they are incurred during the period of construction.

4. If at any time during the period of construction the Government determines that additional funds will be needed from the State to cover the non-Federal proportionate share of projected financial obligations for construction for the current fiscal year, the Government shall notify the State in writing of the additional funds required, and the State, no later than 60 calendar days from receipt of such notice, shall make the additional required funds available through the payment mechanism specified in Article VI.B.1 of this Agreement.

C. In advance of the Government incurring any financial obligation associated with additional work under Article II.B. or II.E. of this Agreement, the Non-Federal Sponsor shall provide the Government with the full amount of the funds required to pay for such additional work by delivering a check payable to "FAO, USAED, Rock Island" to the District Engineer. The Government shall draw from the funds provided by the State such sums as the Government deems necessary to cover the Government's financial obligations for such additional work as they are incurred. In the event the Government determines that the State must provide additional funds to meet its cash contribution, the Government shall notify the State in writing of the additional funds required. Within 30 calendar days thereafter, the State shall provide the Government with a check for the full amount of the additional required funds.

D. Upon completion of the Project or termination of this Agreement, and upon resolution of all relevant claims and appeals, the Government shall conduct a final accounting and furnish the State with the results of the final accounting. The final accounting shall determine total project costs, each party's contribution provided thereto, and each party's required share thereof. The final accounting also shall determine costs due to betterments and the State's cash contribution provided pursuant to Article II.B. of this Agreement.

1. In the event the final accounting shows that the total contribution provided by the State is less than its required share of total project costs plus costs due to any betterments provided in accordance with Article II.B. of this Agreement, the State shall, no later than 90 calendar days after receipt of written notice, make a cash payment to the Government of whatever sum is required to meet the State's required share of total project costs plus costs due to any betterments provided in accordance with Article II.B. of this Agreement.

2. In the event the final accounting shows that the total contribution provided by the State exceeds its required share of total project costs plus costs due to any betterments provided in accordance with Article II.B. of this Agreement, the Government shall, subject to the availability of funds, refund the excess to the State no later than 90 calendar days after the final accounting is complete. In the event existing funds are not available to refund the excess to the State, the Government shall seek such appropriations as are necessary to make the refund.

ARTICLE VII - DISPUTE RESOLUTION

As a condition precedent to a party bringing any suit for breach of this Agreement, the party must first notify the other party in writing of the nature of the purported breach and seek in good faith to resolve the dispute through negotiation. If the parties cannot resolve the dispute through negotiation, they may agree to a mutually acceptable method of non-binding alternative dispute resolution with a qualified third party acceptable to both parties. The parties shall each pay 50 percent of any costs for the services provided by such a third party as such costs are incurred. The existence of a dispute shall not excuse the parties from performance pursuant to this Agreement.

ARTICLE VIII - OPERATION, MAINTENANCE, REPAIR, REPLACEMENT, AND REHABILITATION

A. Upon notification in accordance with Article II.C. of this Agreement and for so long as the Project remains authorized, the State shall operate, maintain, repair, or replace the entire Project or the functional portion of the Project, at no cost to the Government, in a manner compatible with the Project's authorized purposes and in accordance with applicable Federal and State laws as provided in Article XI of this Agreement and specific directions prescribed by the Government in the O&M Manual and any subsequent amendments thereto

B. The State hereby gives the Government a right to enter, at reasonable times and in a reasonable manner, upon property that the State owns or controls for access to the Project for the purpose of inspection and, if necessary, for the purpose of completing, operating, maintaining, repairing, or replacing the Project. If an inspection shows that the State for any reason is failing to perform its obligations under this Agreement, the Government shall send a written notice describing the non-performance to the State. If, after 30 calendar days from receipt of notice, the State continues to fail to perform, then the Government shall have the right to enter, at reasonable times and in a reasonable manner, upon property that the State owns or controls for access to the Project for the purpose of completing, operating, maintaining, repairing, or replacing the Project. No completion, operation, maintenance, repair, or replacement by the Government shall operate to relieve the State of responsibility to meet the State's obligations as set forth in this Agreement, or to preclude the Government from pursuing any other remedy at law or equity to ensure faithful performance pursuant to this Agreement.

C. The term "repair and replacement" refers to predictable, discrete action necessary for continued operation and maintenance of the project, and are included in the operation and maintenance costs identified in the Definite Project Report dated February 199_. In accordance with Section 1103(e)(7)(A) of the Water

Resources Development Act of 1986, as amended, these costs shall be the responsibility of the State

D. The term "rehabilitation of the project" shall mean remedial work to restore the project to a fully functional operational condition that is needed as a result of specific storm or flood events, and that exceeds the annual operation and maintenance requirements identified in the Definite Project Report. If any future rehabilitation of the project is mutually agreed upon by the State and the Government, the cost of such rehabilitation, in accordance with Section 906(e) of the Water Resources Development Act of 1986, shall be 75 percent Federal, borne by the Government, and 25 percent non-Federal, borne by the State.

ARTICLE IX - INDEMNIFICATION

The State shall hold and save the Government free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the Project and any Project-related betterments, or the proposed work, except for damages due to the fault or negligence of the Government or its contractors.

ARTICLE X - MAINTENANCE OF RECORDS AND AUDIT

A. Not later than 60 calendar days after the effective date of this Agreement, the Government and the State shall develop procedures for keeping books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to this Agreement. These procedures shall incorporate, and apply as appropriate, the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 C.F.R. Section 33.20. The Government and the State shall maintain such books, records, documents, and other evidence in accordance with these procedures and for a minimum of three years after the period of construction and resolution of all relevant claims arising therefrom. To the extent permitted under applicable Federal laws and regulations, the Government and the State shall each allow the other to inspect such books, documents, records, and other evidence.

B. Pursuant to 32 C.F.R. Section 33.26, the State is responsible for complying with the Single Audit Act of 1984, 31 U.S.C. Sections 7501-7507, as implemented by Office of Management and Budget (OMB) Circular No. A-128 and Department of Defense Directive 7600.10. Upon request of the State and to the extent permitted under applicable Federal laws and regulations, the Government shall provide to the State and independent auditors any information necessary to enable an audit of the State's activities under this Agreement. The costs of any non-Federal audits performed in accordance with this paragraph shall be allocated in accordance with the provisions of OMB Circulars A-87 and A-128, and such costs as are allocated to the Project shall be included in total project costs and cost shared in accordance with the provisions of this Agreement.

C. In accordance with 31 U.S.C. Section 7503, the Government may conduct audits in addition to any audit that the State is required to conduct under the Single Audit Act. Any such Government audits shall be conducted in accordance with Government Auditing Standards and the cost principles in OMB Circular No. A-87 and other applicable cost principles and regulations. The costs of Government audits performed in accordance with this paragraph shall be included in total project costs and cost shared in accordance with the provisions of this Agreement.

ARTICLE XI - FEDERAL AND STATE LAWS

In the exercise of their respective rights and obligations under this Agreement, the State and the Government agree to comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulations 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army".

ARTICLE XII - RELATIONSHIP OF PARTIES

A. In the exercise of their respective rights and obligations under this Agreement, the Government and the State each act in an independent capacity, and neither is to be considered the officer, agent, or employee of the other.

B. In the exercise of its rights and obligations under this Agreement, neither party shall provide, without the consent of the other party, any contractor with a release that waives or purports to waive any rights such other party may have to seek relief or redress against such contractor either pursuant to any cause of action that such other party may have or for violation of any law.

ARTICLE XIII - OFFICIALS NOT TO BENEFIT

No member of or delegate to the Congress, nor any resident commissioner, shall be admitted to any share or part of this Agreement, or to any benefit that may arise therefrom.

ARTICLE XIV - TERMINATION OR SUSPENSION

A. If at any time the State fails to fulfill its obligations under Article II.B., II.D., II.E., VI, or XVIII.C. of this Agreement, the Assistant Secretary of the Army (Civil Works) shall terminate this Agreement or suspend future performance under this Agreement unless he determines that continuation of work on the Project is in the interest of the United States or is necessary in order to satisfy agreements with any other non-Federal interests in connection with the Project.

B. If the Government fails to receive annual appropriations in amounts sufficient to meet Project expenditures for the then-current or upcoming fiscal year, the Government shall so notify the State in writing, and 60 calendar days thereafter either party may elect without penalty to terminate this Agreement or to suspend future performance under this Agreement. In the event that either party elects to suspend future performance under this Agreement pursuant to this paragraph, such suspension shall remain in effect until such time as the Government receives sufficient appropriations or until either the Government or the State elects to terminate this Agreement.

C. In the event that either party elects to terminate this Agreement pursuant to this Article or Article XV of this Agreement, both parties shall conclude their activities relating to the Project and proceed to a final accounting in accordance with Article VI.D. of this Agreement.

D. Any termination of this Agreement or suspension of future performance under this Agreement in accordance with this Article or Article XV of this Agreement shall not relieve the parties of liability for any obligation previously incurred. Any delinquent payment shall be charged interest at a rate, to be determined by the Secretary of the Treasury, equal to 150 per centum of the average bond equivalent rate of the 13-week Treasury bills auctioned immediately prior to the date on which such payment became delinquent, or auctioned immediately prior to the beginning of each additional 3-month period if the period of delinquency exceeds 3 months.

ARTICLE XV - HAZARDOUS SUBSTANCES

A. After execution of this Agreement and upon direction by the District Engineer, the State shall perform, or cause to be performed, any investigations for hazardous substances that the Government or the State determines to be necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (hereinafter "CERCLA"), 42 U.S.C. Sections 9601-9675, that may exist in, on, or under lands, easements, and rights-of-way that the Government determines, pursuant to Article III of this Agreement, to be required for the construction, operation, and maintenance of the Project. However, for lands that the Government determines to be subject to the navigation servitude, only the Government shall perform such investigations unless the District Engineer provides the State with prior specific written direction, in which case the State shall perform such investigations in accordance with such written direction. All actual costs incurred by the State for such investigations for hazardous substances shall be included in total project costs and cost shared in accordance with the provisions of this Agreement, subject to an audit in accordance with Article X.C. of this Agreement to determine reasonableness, allocability, and allowability of costs.

B. In the event it is discovered through any investigation for hazardous substances or other means that hazardous substances regulated under CERCLA exist in, on, or under any lands, easements, or rights-of-way that the Government determines, pursuant to Article III of this Agreement, to be required for the construction, operation, and maintenance of the Project, the State and the Government shall provide prompt written notice to each other, and the State shall not proceed with the acquisition of the real property interests until both parties agree that the State should proceed.

C. The Government and the State shall determine whether to initiate construction of the Project, or, if already in construction, whether to continue with work on the Project, suspend future performance under this Agreement, or terminate this Agreement for the convenience of the Government, in any case where hazardous substances regulated under CERCLA are found to exist in, on, or under any lands, easements, or rights-of-way that the Government determines, pursuant to Article III of this Agreement, to be required for the construction, operation, and maintenance of the Project. Should the Government and the State determine to initiate or continue with construction after considering any liability that may arise under CERCLA, the State shall be responsible, as between the Government and the State, for the costs of clean-up and response, to include the costs of any studies and investigations necessary to determine an appropriate response to the contamination. Such costs shall not be considered a part of total project costs. In the event the State fails to provide any funds necessary to pay for clean up and response costs or to otherwise discharge the State's responsibilities under this paragraph upon direction by the Government, the Government may, in its sole discretion, either terminate this Agreement for the convenience of the Government, suspend future performance under this Agreement, or continue work on the Project.

D. The State and the Government shall consult with each other in accordance with Article V of this Agreement in an effort to ensure that responsible parties bear any necessary clean up and response costs as defined in CERCLA. Any decision made pursuant to paragraph C. of this Article shall not relieve any third party from any liability that may arise under CERCLA.

E. As between the Government and the State, the State shall be considered the operator of the Project for purposes of CERCLA liability. To the maximum extent practicable, the State shall operate, maintain, repair, replace, and rehabilitate the project in a manner that will not cause liability to arise under CERCLA.

ARTICLE XVI - NOTICES

a. Any notice, request, demand, or other communication required or permitted to be given under this Agreement shall be deemed to have been duly given if in writing and either delivered personally or by telegram or mailed by first-class, registered, or certified mail, as follows:

If to the State:

Director
Illinois Department of Natural Resources
Lincoln Tower Plaza
524 South 2nd Street
Springfield, Illinois 62701-1787

If to the Government:

District Engineer
U.S. Army Engineer District, Rock Island
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

B. A party may change the address to which such communications are to be directed by giving written notice to the other party in the manner provided in this Article.

C. Any notice, request, demand, or other communication made pursuant to this Article shall be deemed to have been received by the addressee at the earlier of such time as it is actually received or seven calendar days after it is mailed.

ARTICLE XVII - CONFIDENTIALITY

To the extent permitted by the laws governing each party, the parties agree to maintain the confidentiality of exchanged information when requested to do so by the providing party.

ARTICLE XVIII - HISTORIC PRESERVATION

A. The costs of identification, survey and evaluation of historic properties shall be included in total project costs and cost shared in accordance with the provisions of this Agreement.

B. As specified in Section 7(a) of Public Law 93-291 (16 U.S.C. Section 469c(a)), the costs of mitigation and data recovery activities associated with historic preservation shall be borne entirely by the Government and shall not be included in total project costs, up to the statutory limit of one percent of the total amount the Government is authorized to expend for the Project.

C. The Government shall not incur cost for mitigation and data recovery that exceed the statutory one percent limit specified in paragraph B. of this Article unless and until the Assistant Secretary of the Army (Civil Works) has waived that limit in accordance with Section 208(3) of Public Law 96-515 (16 U.S.C. Section 469c-2(3)). Any costs of mitigation and data recovery that exceed the one percent limit shall be included in total project costs and cost shared in accordance with the provisions of this Agreement.

ARTICLE XIX - SECTION 1103 PROJECT COST LIMITS

The State has reviewed the provisions set forth in Section 1103 of Public Law 99-662, as amended, and understands that Section 1103 establishes the maximum amount of costs for the habitat rehabilitation and enhancement component of the Upper Mississippi River System Environmental Management Program.

Notwithstanding any other provisions of this Agreement, the Government shall not make a new project expenditure, or afford credit toward total project costs for the value of any contribution provided by the State, if such obligation, expenditure, or credit would result in total project costs, plus the value of any obligations already made under the habitat rehabilitation and enhancement component of the Upper Mississippi River System Environmental Management Program, exceeding the maximum amount, unless otherwise authorized by law.

ARTICLE XX - OBLIGATION OF FUTURE APPROPRIATION

Nothing herein shall constitute, nor be deemed to constitute, an obligation of future appropriations by the Illinois General Assembly when such obligation would be inconsistent with the State's constitutional or statutory limitations.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement, which shall become effective upon the date it is signed by the Assistant Secretary of the Army (Civil Works).

THE DEPARTMENT OF THE ARMY	**THE STATE OF ILLINOIS** **DEPARTMENT OF NATURAL RESOURCES**
BY: **[SIGNATURE]**	BY: **[SIGNATURE]**
[TYPED NAME] **[TITLE IN FULL]**	***[TYPED NAME]*** **[TITLE IN FULL]**
DATE: ____________________	DATE: ____________________

CERTIFICATE OF AUTHORITY

I, ____________________, do hereby certify that I am the principal legal officer of the State of Illinois, that the State of Illinois is a legally constituted public body with full authority and legal capability to perform the terms of the Agreement between the Department of the Army and the State of Illinois in connection with the Rice Lake State Fish and Wildlife Area Habitat Rehabilitation and Enhancement Project, and to pay damages, in accordance with the terms of this agreement, if necessary, in the event of the failure to perform, as required by Section 221 of Public Law 91-611 (42 U.S.C. Section 1962d-5b), and that the persons who have executed this Agreement on behalf of the State of Illinois have acted within their statutory authority.

IN WITNESS WHEREOF, I have made and executed this certification this _______ day of ________________ 19____.

[SIGNATURE]

____

[TYPED NAME]
[TITLE IN FULL]

CERTIFICATION REGARDING LOBBYING
RICE LAKE STATE FISH AND WILDLIFE AREA

The undersigned certifies, to the best of his or her knowledge and belief that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrant, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

[SIGNATURE OF PCA SIGNATORY]
[TYPED NAME]
[TITLE IN FULL]

DATE: ____________________

[IM1]

CERTIFICATION OF LEGAL REVIEW

The draft Project Cooperation Agreement for Rice Lake State Fish and Wildlife Habitat Rehabilitation and Enhancement Project has been fully reviewed by the Office of Counsel, USAED, Rock Island, Illinois.

THOMAS F. CRANE
District Counsel

EXHIBIT 1

RICE LAKE, ILLINOIS
ENVIRONMENTAL MANAGEMENT PROJECT
ASSESSMENT OF NON-FEDERAL SPONSOR'S
REAL ESTATE ACQUISITION CAPABILITY

I. **Legal Authority**:

a. Does the sponsor have legal authority to acquire and hold title to real property for project purposes? YES

b. Does the sponsor have the power of eminent domain for this project? UNKNOWN

c. Does the sponsor have "quick take" authority for this project? UNKNOWN

d. Are any of the lands/interests in lands required for this project located outside the sponsor's political boundary? NO

e. Are any of the lands/interests in land required for the project owned by an entity whose property the sponsor cannot condemn? UNKNOWN

II. **Human Resource Requirements**:

a. Will the sponsor's in-house staff require training to become familiar with the real estate requirements of Federal projects including PL 91-646, as amended? NO

b. If the answer to II.a. is "yes", has a reasonable plan been developed to provide such training? N/A

c. Does the sponsor's in-house staff have sufficient real estate acquisition experience to meet its responsibilities for the project? YES

d. Is the sponsor's projected in-house staffing level sufficient considering its other work load, if any, and the project schedule? UNKNOWN

e. Can the sponsor obtain contractor support, if required, in a timely fashion? UNKNOWN

f. Will the sponsor likely request USACE assistance in acquiring real estate? NO

III. **Other Project Variables**:

a. Will the sponsor's staff be located within reasonable proximity to the project site? NO

b. Has the sponsor approved the project/real estate schedule/milestones? NO

IV. **Overall Assessment**:

a. Has the sponsor performed satisfactorily on other USACE projects? YES

b. With regard to this project, the sponsor is anticipated to be FULLY CAPABLE.

V. **Coordination**: *

a. Has this assessment been coordinated with the sponsor? NO

b. Does the sponsor concur with this assessment?

Prepared by:

Robert F. Lazenby
Realty Specialist

Reviewed and Approved by:

Patricia M. Dice
Chief, Real Estate Division

* This assessment will be fully coordinated with the local sponsor, after a decision is made whether Duck Island is to be a part of the project.

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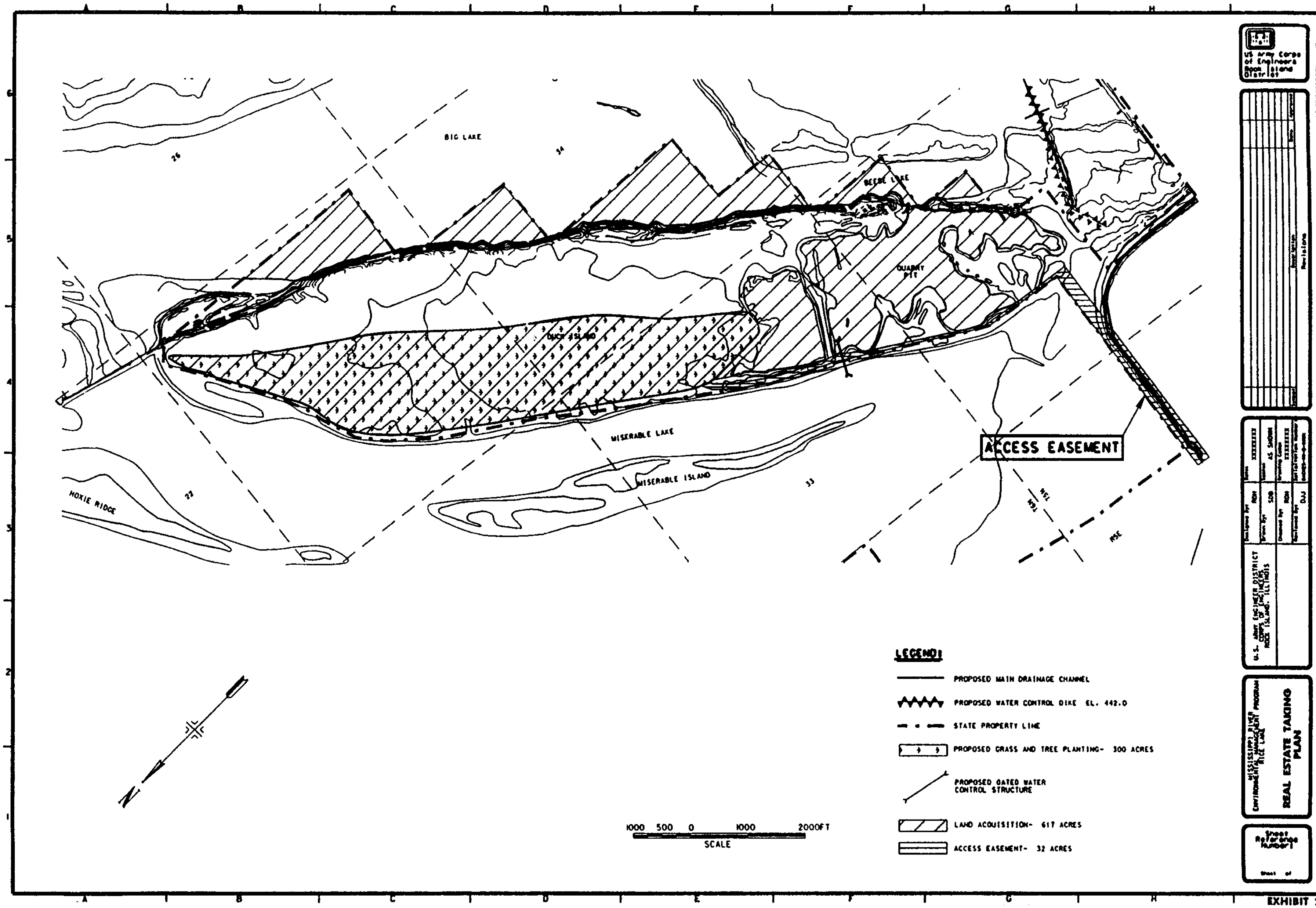

EXHIBIT 2

EXHIBIT 2

HABITAT EVALUATION AND QUANTIFICATION

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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17D)

RICE LAKE STATE FISH AND WILDLIFE AREA
HABITAT REHABILITATION AND ENHANCEMENT

LA GRANGE POOL, ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

APPENDIX D
HABITAT EVALUATION AND QUANTIFICATION

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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17D)

RICE LAKE STATE FISH AND WILDLIFE AREA
HABITAT REHABILITATION AND ENHANCEMENT

LA GRANGE POOL, ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

APPENDIX D
HABITAT EVALUATION AND QUANTIFICATION

PURPOSE

Habitat Evaluation Procedures (HEP) were used to evaluate the potential benefits of alternative habitat improvement features at the Rice Lake State Fish and Wildlife Area. Active participants included biologists from the Rock Island District of the Corps of Engineers; the U.S. Fish and Wildlife Service, Rock Island Ecological Service Office; and the Illinois Department of Natural Resources.

BACKGROUND

The need for quantification of HREP outputs as a project performance evaluation tool, a project ranking tool, and a project planning tool has been discussed by various agencies associated with the UMRS-EMP. This application involves quantification solely for the purpose of project planning.

Habitat Units (HUs) were calculated from the HEP models. Habitat units are a measure of habitat quality (habitat suitability indices (HSI)) and quantity (acres). Annualization of HUs can then be used to determine changes brought about by project features/alternatives over time. This annualization computes average annual habitat units (AAHUs). Once construction begins and as a project matures, habitat changes occur, and therefore habitat benefits may change. Many features, such as tree planting, would not begin to show benefits until well into the project life. The particular dynamics of the ecosystem under study then determine the target years chosen for analysis. With or without a project, habitat conditions change over time; therefore, the overall value of a proposed project depends upon the comparison of with-project benefits and without-project benefits.

METHODOLOGY

The HEP application used in this evaluation was the Wildlife Habitat Appraisal Guide (WHAG) (Urich, *et al.*, 1984). The WHAG was developed by the Missouri Department of Conservation. It is a field evaluation procedure designed to estimate habitat quality and account for changes due to land management practices. Checklist-type appraisal guides are used for both upland and wetland habitats, and computer programs are used to analyze field data in terms of habitat suitability for various evaluation species. This analysis employed a multi-agency team approach with representatives from the Corps of Engineers, the U.S. Fish and Wildlife Service, and the Illinois Department of Natural Resources.

The WHAG analysis is a numerical system for evaluating the quality and quantity of particular habitats for species selected by WHAG team members. The qualitative component of the analysis is known as the habitat suitability index (HSI) and is rated on a 0.1 to 1.0 scale. The suitability of a given habitat type for a set of evaluation species is determined by the qualitative characteristics of the habitat type. The WHAG procedures include the use of limiting factors, which is a habitat requirement for an individual species during a critical time of year. Absence of that habitat characteristic makes the habitat unsuitable and results in the lowest HSI value of 0.1. The quantitative component of the WHAG analysis is the measure of acres of habitat that are available for the selected species. From the qualitative and quantitative determinations, the standard unit of measure, the habitat unit (HU), is calculated using the formula (HSI x Acres = HUs).

Numerical ranking for wetland and terrestrial habitat values was accomplished using the existing WHAG field data sheets for non-forested wetland and upland habitats, and the MOFISH overflow waters matrix. Existing habitat conditions were evaluated on-site by the team, while future conditions both with and without the project were estimated using the expertise of team members. The team considered wetland and upland habitats and both game and nongame aspects of the project. Evaluated species were selected to represent groups of species having similar habitat requirements.

For project planning and impact analysis, project life was established as 50 years. To facilitate comparison, target years were established at 0 (existing conditions), 1, 25, and 50 years. HSIs and average annual habitat units (AAHUs) for each evaluation species were calculated to reflect expected habitat conditions over the life of the project.

Results are provided for calculated HSI and estimated total AAHU values for the non-forested wetlands, upland, and aquatic components of the project (Tables D-1 through D-7). After existing conditions were determined, the study team reviewed the habitat appraisal guides to determine where habitat quality can be improved. HUs were annualized for target years using the USFWS HEP 80 program in order to evaluate changes in project features over time.

Habitat quality ratings can be improved by: (1) increasing acreages for particular habitat types that may be limited or lacking; (2) altering a limiting factor, such as unpredictable water levels; (3) altering a management strategy such as cropping practice or cover crop composition; or (4) a combination of the preceding, depending on management goals, target species requirements, or available funds.

Primary project goals for habitat enhancement include improving water level control to enhance management capability, providing fish egress from Rice Lake during drawdown periods, and enhancing terrestrial habitat quality. Benefits would accrue to migratory and resident birds and fish, furbearers, and game as well as nongame species. These goals led the study team to select appraisal guides for wetland, aquatic, and upland habitats, with a total of 25 species selected as evaluation species (species of emphasis).

Prior to field evaluation, the study team reviewed aerial photography, topographic maps, and preliminary design drawings. During field evaluation, assumptions were developed regarding existing conditions and projected post-project conditions relative to limiting factors and management practices.

TABLE D-1
Habitat Evaluation for Combination A2+B2:
Dike at Elevation 442.0 + 100,000 gpm New Pump Station

Habitat Suitability Index
Increase water level mgmt capability (A2 + B2)

	Present	Future Without			Future With		
Species	YR 0	YR 1	YR 25	YR 50	YR 1	YR 25	YR 50
Channel catfish	-	-	-	-	-	-	-
Crappie	-	-	-	-	-	-	-
Largemouth bass	-	-	-	-	-	-	-
Gizzard shad	-	-	-	-	-	-	-
Carp	-	-	-	-	-	-	-
Bluegill	-	-	-	-	-	-	-
Black bullhead	-	-	-	-	-	-	-
Mallard	0.1	0.1	0.1	0.1	0.54	0.54	0.54
Canada goose	0.1	0.1	0.1	0.1	0.66	0.66	0.66
Least bittern	0.71	0.71	0.69	0.69	0.71	0.76	0.76
Lesser yellowlegs	0.59	0.59	0.59	0.59	0.68	0.68	0.66
Muskrat	0.29	0.29	0.28	0.28	0.33	0.33	0.33
King rail	0.1	0.1	0.1	0.1	0.67	0.67	0.67
Green-backed heron	0.69	0.69	0.75	0.75	0.78	0.78	0.78
White-tailed deer	-	-	-	-	-	-	-
Wild Turkey	-	-	-	-	-	-	-
Fox squirrel	-	-	-	-	-	-	-
Dickcissel	-	-	-	-	-	-	-
Wood thrush	-	-	-	-	-	-	-
Kentucky warbler	-	-	-	-	-	-	-
Eastern bluebird	-	-	-	-	-	-	-
Bobwhite quail	-	-	-	-	-	-	-
Eastern cottontail	-	-	-	-	-	-	-
Indigo bunting	-	-	-	-	-	-	-
Ring-necked pheasant	-	-	-	-	-	-	-

Acres of available habitat*

habitat type	without	with	gain/loss
nonforest wetland/ overflow waters			
total	0	0	0
nonforest wetland/ overflow waters	3054	3054	0
total	3054	3054	0
upland hardwoods			
grasslands			
croplands			
total	0	0	0

Habitat Units for Evaluated Species

	Present	Future Without				Future With				
	YR 0	YR 1	*YR 25*	*YR 50*	AAHUs	YR 1	*YR 25*	*YR 50*	*AAHUs*	*net AAHUs*
Mallard	0.0	0.0	0.0	0.0	0.0	1658.9	1658.9	1658.9	1645.0	1645.0
Canada goose	0.0	0.0	0.0	0.0	0.0	2026.1	2026.1	2026.1	2008.9	2008.9
Least bittern	2181.4	2181.4	2094.2	2094.2	2116.9	2181.4	2312.3	2312.3	2278.3	161.4
Lesser yellowlegs	1796.5	1796.5	1796.5	1796.5	1796.5	2083.9	2083.9	2012.0	2063.1	266.6
Muskrat	880.3	880.3	862.3	862.3	867.0	1006.0	1006.0	1006.0	1004.8	137.8
King rail	0.0	0.0	0.0	0.0	0.0	2050.5	2050.5	2050.5	2033.1	2033.1
Green-backed heron	2119.8	2119.8	2299.5	2299.5	2252.8	2371.3	2371.3	2371.3	2368.8	116.0
AAHUs for Evaluated Species = (sum of net AAHUs) x 1.0 *										4081.90

* reliability factor of combination A2 + B2

TABLE D-2

Habitat Evaluation for Combination A2+B1: Dike at Elevation 442.0 + 50,000 gpm New Pump Station

	Habitat Suitability Index Increase water level mgmt capability (A2 + B1)						
	Present	Future Without			Future With		
Species	YR 0	YR 1	YR 25	YR 50	YR 1	YR 25	YR 50
Channel catfish	-	-	-	-	-	-	-
Crappie	-	-	-	-	-	-	-
Largemouth bass	-	-	-	-	-	-	-
Gizzard shad	-	-	-	-	-	-	-
Carp	-	-	-	-	-	-	-
Bluegill	-	-	-	-	-	-	-
Black bullhead	-	-	-	-	-	-	-
Mallard	0.1	0.1	0.1	0.1	0.54	0.54	0.54
Canada goose	0.1	0.1	0.1	0.1	0.66	0.66	0.66
Least bittern	0.71	0.71	0.69	0.69	0.71	0.76	0.76
Lesser yellowlegs	0.59	0.59	0.59	0.59	0.68	0.68	0.66
Muskrat	0.29	0.29	0.28	0.28	0.33	0.33	0.33
King rail	0.1	0.1	0.1	0.1	0.67	0.67	0.67
Green-backed heron	0.69	0.69	0.75	0.75	0.78	0.78	0.78
White-tailed deer	-	-	-	-	-	-	-
Wild Turkey	-	-	-	-	-	-	-
Fox squirrel	-	-	-	-	-	-	-
Dickcissel	-	-	-	-	-	-	-
Wood thrush	-	-	-	-	-	-	-
Kentucky warbler	-	-	-	-	-	-	-
Eastern bluebird	-	-	-	-	-	-	-
Bobwhite quail	-	-	-	-	-	-	-
Eastern cottontail	-	-	-	-	-	-	-
Indigo bunting	-	-	-	-	-	-	-
Ring-necked pheasant	-	-	-	-	-	-	-

Acres of available habitat*			
habitat type	without	with	gain/loss
nonforest wetland/ overflow waters			
total	0	0	0
nonforest wetland/ overflow waters	3054	3054	0
total	3054	3054	0
upland hardwoods			
grasslands			
croplands			
total	0	0	0

	Habitat Units for Evaluated Species									
	Present	Future Without				Future With				
	YR 0	YR 1	YR 25	YR 50	AAHUs	YR 1	YR 25	YR 50	AAHUs	net AAHUs
Mallard	0.0	0.0	0.0	0.0	0.0	1658.9	1658.9	1658.9	1645.0	1645.0
Canada goose	0.0	0.0	0.0	0.0	0.0	2026.1	2026.1	2026.1	2008.9	2008.9
Least bittern	2181.4	2181.4	2094.2	2094.2	2116.9	2181.4	2312.3	2312.3	2278.3	161.4
Lesser yellowlegs	1796.5	1796.5	1796.5	1796.5	1796.5	2083.9	2083.9	2012.0	2063.1	266.6
Muskrat	880.3	880.3	862.3	862.3	867.0	1006.0	1006.0	1006.0	1004.8	137.8
King rail	0.0	0.0	0.0	0.0	0.0	2050.5	2050.5	2050.5	2033.1	2033.1
Green-backed heron	2119.8	2119.8	2299.5	2299.5	2252.8	2371.3	2371.3	2371.3	2368.8	116.0
AAHUs for Target Species = (sum of net AAHUs) x 0.74 *										3020.61

* reliability factor of combination A2 + B1

TABLE D-3

Habitat Evaluation for Combination A2+B0: Dike at Elevation 442.0 + No New Pump Station

	Habitat Suitability Index Increase water level mgmt capability (A2 + B0)						
	Present	Future Without			Future With		
Species	YR 0	YR 1	YR 25	YR 50	YR 1	YR 25	YR 50
Channel catfish	-	-	-	-	-	-	-
Crappie	-	-	-	-	-	-	-
Largemouth bass	-	-	-	-	-	-	-
Gizzard shad	-	-	-	-	-	-	-
Carp	-	-	-	-	-	-	-
Bluegill	-	-	-	-	-	-	-
Black bullhead	-	-	-	-	-	-	-
Mallard	0.1	0.1	0.1	0.1	0.54	0.54	0.54
Canada goose	0.1	0.1	0.1	0.1	0.66	0.66	0.66
Least bittern	0.71	0.71	0.69	0.69	0.71	0.76	0.76
Lesser yellowlegs	0.59	0.59	0.59	0.59	0.68	0.68	0.66
Muskrat	0.29	0.29	0.28	0.28	0.33	0.33	0.33
King rail	0.1	0.1	0.1	0.1	0.67	0.67	0.67
Green-backed heron	0.69	0.69	0.75	0.75	0.78	0.78	0.78
White-tailed deer	-	-	-	-	-	-	-
Wild Turkey	-	-	-	-	-	-	-
Fox squirrel	-	-	-	-	-	-	-
Dickcissel	-	-	-	-	-	-	-
Wood thrush	-	-	-	-	-	-	-
Kentucky warbler	-	-	-	-	-	-	-
Eastern bluebird	-	-	-	-	-	-	-
Bobwhite quail	-	-	-	-	-	-	-
Eastern cottontail	-	-	-	-	-	-	-
Indigo bunting	-	-	-	-	-	-	-
Ring-necked pheasant	-	-	-	-	-	-	-

Acres of available habitat*			
habitat type	without	with	gain/loss
nonforest wetland/ overflow waters			
total	0	0	0
nonforest wetland/ overflow waters	3054	3054	0
total	3054	3054	0
upland hardwoods			
grasslands			
croplands			
total	0	0	0

	Habitat Units for Evaluated Species									
	Present	Future Without				Future With				
	YR 0	YR 1	YR 25	YR 50	AAHUs	YR 1	YR 25	YR 50	AAHUs	net AAHUs
Mallard	0.0	0.0	0.0	0.0	0.0	1658.9	1658.9	1658.9	1645.0	1645.0
Canada goose	0.0	0.0	0.0	0.0	0.0	2026.1	2026.1	2026.1	2008.9	2008.9
Least bittern	2181.4	2181.4	2094.2	2094.2	2116.9	2181.4	2312.3	2312.3	2278.3	161.4
Lesser yellowlegs	1796.5	1796.5	1796.5	1796.5	1796.5	2083.9	2083.9	2012.0	2063.1	266.6
Muskrat	880.3	880.3	862.3	862.3	867.0	1006.0	1006.0	1006.0	1004.8	137.8
King rail	0.0	0.0	0.0	0.0	0.0	2050.5	2050.5	2050.5	2033.1	2033.1
Green-backed heron	*2119.8*	*2119.8*	*2299.5*	*2299.5*	*2252.8*	*2371.3*	*2371.3*	*2371.3*	*2368.8*	*116.0*
AAHUs for Evaluated Species = (sum of net AAHUs) x 0.51 *										2081.8

* reliability factor of combination A2 + B0

TABLE D-4
Habitat Evaluation for Combination A1+B0:
Dike at Elevation 440.0 + No New Pump Station

	Habitat Suitability Index Increase water level mgmt capability (A1 + B0)						
	Present	Future Without			Future With		
Species	YR 0	YR 1	YR 25	YR 50	YR 1	YR 25	YR 50
Channel catfish	-	-	-	-	-	-	-
Crappie	-	-	-	-	-	-	-
Largemouth bass	-	-	-	-	-	-	-
Gizzard shad	-	-	-	-	-	-	-
Carp	-	-	-	-	-	-	-
Bluegill	-	-	-	-	-	-	-
Black bullhead	-	-	-	-	-	-	-
Mallard	0.1	0.1	0.1	0.1	0.54	0.54	0.54
Canada goose	0.1	0.1	0.1	0.1	0.66	0.66	0.66
Least bittern	0.71	0.71	0.69	0.69	0.71	0.76	0.76
Lesser yellowlegs	0.59	0.59	0.59	0.59	0.68	0.68	0.66
Muskrat	0.29	0.29	0.28	0.28	0.33	0.33	0.33
King rail	0.1	0.1	0.1	0.1	0.67	0.67	0.67
Green-backed heron	0.69	0.69	0.75	0.75	0.78	0.78	0.78
White-tailed deer	-	-	-	-	-	-	-
Wild Turkey	-	-	-	-	-	-	-
Fox squirrel	-	-	-	-	-	-	-
Dickcissel	-	-	-	-	-	-	-
Wood thrush	-	-	-	-	-	-	-
Kentucky warbler	-	-	-	-	-	-	-
Eastern bluebird	-	-	-	-	-	-	-
Bobwhite quail	-	-	-	-	-	-	-
Eastern cottontail	-	-	-	-	-	-	-
Indigo bunting	-	-	-	-	-	-	-
Ring-necked pheasant	-	-	-	-	-	-	-

Acres of available habitat*			
habitat type	without	with	gain/loss
nonforest wetland/ overflow waters			
total	0	0	0
nonforest wetland/ overflow waters	3054	3054	0
total	3054	3054	0
upland hardwoods			
grasslands			
croplands			
total	0	0	0

	Habitat Units for Evaluated Species									
	Present	Future Without				Future With				
	YR 0	YR 1	YR 25	YR 50	AAHUs	YR 1	YR 25	YR 50	AAHUs	net AAHUs
Mallard	0.0	0.0	0.0	0.0	0.0	1658.9	1658.9	1658.9	1645.0	1645.0
Canada goose	0.0	0.0	0.0	0.0	0.0	2026.1	2026.1	2026.1	2008.9	2008.9
Least bittern	2181.4	2181.4	2094.2	2094.2	2116.9	2181.4	2312.3	2312.3	2278.3	161.4
Lesser yellowlegs	1796.5	1796.5	1796.5	1796.5	1796.5	2083.9	2083.9	2012.0	2063.1	266.6
Muskrat	880.3	880.3	862.3	862.3	867.0	1006.0	1006.0	1006.0	1004.8	137.8
King rail	0.0	0.0	0.0	0.0	0.0	2050.5	2050.5	2050.5	2033.1	2033.1
Green-backed heron	2119.8	2119.8	2299.5	2299.5	2252.8	2371.3	2371.3	2371.3	2368.8	116.0
AAHUs for Evaluated Species = (sum of net AAHUs) x 0.46 *										1877.7

* reliability factor of combination A1 + B0

TABLE D-5

Habitat Evaluation for Terrestrial Habitat Enhancement
Warm Season Grass Planting (200 Acres)

	Habitat Suitability Index										
	Warm Season Grass Planting - 200 Acres (C1)										
	Present	Future Without			Future With			Acres of available habitat*			
Species	YR 0	YR 1	YR 25	YR 50	YR 1	YR 25	YR 50	habitat type	without	with	gain/loss
Channel catfish	-	-	-	-	-	-	-	nonforest wetland/			
Crappie	-	-	-	-	-	-	-	overflow waters			
Largemouth bass	-	-	-	-	-	-	-				
Gizzard shad	-	-	-	-	-	-	-				
Carp	-	-	-	-	-	-	-	total	0	0	0
Bluegill	-	-	-	-	-	-	-				
Black bullhead	-	-	-	-	-	-	-				
Mallard	0.37	0.37	0.37	0.37	0.37	0.37	0.37	nonforest wetland/			
Canada goose	0.54	0.54	0.54	0.54	0.54	0.54	0.54	overflow waters			
Least bittern	-	-	-	-	-	-	-	cropland	600	300	-300
Lesser yellowlegs	-	-	-	-	-	-	-	total	600	300	-300
Muskrat	-	-	-	-	-	-	-				
King rail	-	-	-	-	-	-	-				
Green-backed heron	-	-	-	-	-	-	-				
White-tailed deer	0.64	0.64	0.64	0.64	0.71	0.71	0.71				
Wild Turkey	0.1	0.1	0.1	0.1	0.75	0.75	0.75				
Fox squirrel	-	-	-	-				upland hardwoods	0	0	0
Dickcissel	-	-	-	-	0.81	0.81	0.81	grasslands	0	200	200
Wood thrush	-	-	-	-	-	-	-				
Kentucky warbler	-	-	-	-	-	-	-				
Eastern bluebird	-	-	-	-	0.72	0.72	0.72	croplands	600	400	-200
Bobwhite quail	0.11	0.11	0.11	0.11	0.51	0.51	0.51	total	600	600	0
Eastern cottontail	0.1	0.1	0.1	0.1	0.43	0.43	0.43				
Indigo bunting	-	-	-	-	0.1	0.1	0.1				
Ring-necked pheasant	0.5	0.5	0.5	0.5	0.73	0.73	0.73				

	Habitat Units for Evaluated Species									
	Present	Future Without				Future With				
	YR 0	YR 1	YR 25	YR 50	AAHUs	YR 1	YR 25	YR 50	AAHUs	net AAHUs
Mallard	222.9	222.9	222.9	222.9	222.9	111.5	111.5	111.5	111.5	-111.4
Canada goose	325.7	325.7	325.7	325.7	325.7	162.9	162.9	162.9	162.9	-162.8
White-tailed deer	385.3	385.3	385.3	385.3	385.3	334.4	334.4	334.4	330.0	-55.3
Wild Turkey						150.9	150.9	150.9	148.9	148.9
Dickcissel						162.9	162.9	162.9	160.7	160.7
Eastern bluebird						143.5	143.5	143.5	141.6	141.6
Bobwhite quail	63.3	63.3	63.3	63.3	63.3	133.0	133.0	133.0	131.1	67.8
Eastern cottontail						86.4	86.4	86.4	85.2	85.2
Ring-necked pheasant	302.9	302.9	302.9	302.9	302.9	296.6	296.6	296.6	292.6	-10.3
AAHUs for Evaluated Species										264.40

TABLE D-6

Habitat Evaluation for Terrestrial Habitat Enhancement

Warm Season Grass Planting (200 Acres) + Mast Tree Planting (100 acres)

	Habitat Suitability Index – Warm Season Grass/Mast Tree Planting - 300 Acres (C2)						
	Present	Future Without			Future With		
Species	YR 0	YR 1	YR 25	YR 50	YR 1	YR 25	YR 50
White-tailed deer	0.64	0.64	0.64	0.64	-	-	-
Wild Turkey	0.1	0.1	0.1	0.1	-	-	-
Dickcissel	-	-	-	-	0.81	0.81	0.81
Eastern bluebird	-	-	-	-	0.72	0.72	0.72
Bobwhite quail	*0.11*	*0.11*	*0.11*	*0.11*	0.51	0.51	0.51
Eastern cottontail	0.1	0.1	0.1	0.1	0.43	0.43	0.43
Eastern bluebird	-	-	-	-	0.37	0.37	0.37
Bobwhite quail	0.11	0.11	0.11	0.11	0.54	0.54	0.54
Eastern cottontail	0.1	0.1	0.1	0.1	-	-	-
Ring-necked pheasant	0.5	0.5	0.5	0.5	0.73	0.73	0.73
Mallard	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Canada goose	0.54	0.54	0.54	0.54	0.54	0.54	0.54
White-tailed deer	0.64	0.64	0.64	0.64	0.67	0.67	0.67
Wild Turkey	0.1	0.1	0.1	0.1	0.24	0.24	0.25
Fox squirrel	-	-	-	-	0.1	0.55	0.58
Dickcissel	-	-	-	-	0.81	0.81	0.81
Wood thrush	-	-	-	-	0.1	0.36	0.56
Kentucky warbler	-	-	-	-	0.1	0.1	0.52
Eastern bluebird	-	-	-	-	0.78	0.62	0.1
Bobwhite quail	*0.11*	*0.11*	*0.11*	*0.11*	*0.27*	*0.2*	*0.16*
Eastern cottontail	0.1	0.1	0.1	0.1	0.29	0.19	0.15
Indigo bunting	-	-	-	-	0.1	0.68	0.1
Ring-necked pheasant	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Acres of available habitat*				
habitat type		without	with	gain/loss
grassland		0	200	200
	total	0	200	200
cropland		600	300	-300
	total	600	300	-300
upland hardwoods		0	100	100
	total	0	100	100

	Habitat Units for Evaluated Species									
	Present	Future Without				Future With				
	YR 0	YR 1	YR 25	YR 50	AAHUs	YR 1	YR 25	YR 50	AAHUs	net AAHUs
Mallard	222.9	222.9	222.9	222.9	222.9	111.5	111.5	111.5	111.5	-111.4
Canada goose	325.7	325.7	325.7	325.7	325.7	162.9	162.9	162.9	162.9	-162.8
White-tailed deer	385.3	385.3	385.3	385.3	385.3	334.4	334.4	334.4	597.6	212.3
Wild Turkey	0.0	0.0	0.0	0.0	0.0	150.9	150.9	150.9	246.5	246.5
Fox squirrel	0.0	0.0	0.0	0.0	0.0	0.0	55.3	57.6	44.0	44.0
Dickcissel	0.0	0.0	0.0	0.0	0.0	162.9	162.9	162.9	160.7	160.7
Wood thrush	0.0	0.0	0.0	0.0	0.0	0.0	36.0	56.0	34.1	34.1
Kentucky warbler	0.0	0.0	0.0	0.0	0.0	0.0	0.0	51.8	20.3	20.3
Eastern bluebird	0.0	0.0	0.0	0.0	0.0	221.1	205.9	143.5	193.8	193.8
Bobwhite quail	63.3	63.3	63.3	63.3	63.3	239.9	214.7	197.0	214.6	151.3
Eastern cottontail	0.0	0.0	0.0	0.0	0.0	185.5	162.1	144.6	162.3	162.3
Indigo bunting	0.0	0.0	0.0	0.0	0.0	0.0	67.5	0.0	38.0	38.0
Ring-necked pheasant	302.9	302.9	302.9	302.9	302.9	296.6	296.6	296.6	445.5	142.6
AAHUs for Evaluated Species										1131.7

TABLE D-7

Habitat Evaluation for Fish Passage Structure
One 60-Inch-Diameter Box Culvert

	Habitat Suitability Index — Fish Egress Culvert (D1)							Acres of available habitat*			
	Present	Future Without			Future With						
Species	**YR 0**	**YR 1**	**YR 25**	**YR 50**	**YR 1**	**YR 25**	**YR 50**	**habitat type**	**without**	**with**	**gain/loss**
Channel catfish	0.1	0.1	0.1	0.1	0.28	0.3	0.3	nonforest wetland/			
Crappie	0.1	0.1	0.1	0.1	0.1	0.14	0.14	overflow waters	3054	3054	0
Largemouth bass	0.1	0.1	0.1	0.1	0.1	0.15	0.15				
Gizzard shad	0.1	0.1	0.1	0.1	0.35	0.35	0.35				
Carp	0.1	0.1	0.1	0.1	0.38	0.38	0.38	total	3054	3054	0
Bluegill	0.1	0.1	0.1	0.1	0.1	0.16	0.16				
Black bullhead	0.1	0.1	0.1	0.1	0.38	0.38	0.38				
Mallard	-	-	-	-	-	-	-	nonforest wetland/			
Canada goose	-	-	-	-	-	-	-	overflow waters			
Least bittern	-	-	-	-	-	-	-	total	0	0	0
Lesser yellowlegs	-	-	-	-	-	-	-				
Muskrat	-	-	-	-	-	-	-				
King rail	-	-	-	-	-	-	-				
Green-backed heron	-	-	-	-	-	-	-				
White-tailed deer	-	-	-	-	-	-	-				
Wild Turkey	-	-	-	-	-	-	-				
Fox squirrel	-	-	-	-	-	-	-	upland hardwoods			
Dickcissel	-	-	-	-	-	-	-	grasslands			
Wood thrush	-	-	-	-	-	-	-				
Kentucky warbler	-	-	-	-	-	-	-				
Eastern bluebird	-	-	-	-	-	-	-	croplands			
Bobwhite quail	-	-	-	-	-	-	-	total	0	0	0
Eastern cottontail	-	-	-	-	-	-	-				
Indigo bunting	-	-	-	-	-	-	-				
Ring-necked pheasant	-	-	-	-	-	-	-				

	Habitat Units for Evaluated Species									
	Present	*Future Without*				*Future With*				
	YR 0	**YR 1**	**YR 25**	**YR 50**	**AAHUs**	**YR 1**	**YR 25**	**YR 50**	**AAHUs**	***net AAHUs***
Channel catfish	0.0	0.0	0.0	0.0	0.0	860.7	902.3	902.3	885.9	885.9
Crappie	0.0	0.0	0.0	0.0	0.0	0.0	435.2	435.2	401.4	401.4
Largemouth bass	0.0	0.0	0.0	0.0	0.0	0.0	458.1	458.1	418.4	418.4
Gizzard shad	0.0	0.0	0.0	0.0	0.0	1068.9	1068.9	1068.9	1061.3	1061.3
Carp	0.0	0.0	0.0	0.0	0.0	1153.7	1153.7	1153.7	1145.3	1145.3
Bluegill	0.0	0.0	0.0	0.0	0.0	0.0	473.4	473.4	429.7	429.7
Black bullhead	0.0	0.0	0.0	0.0	0.0	1167.7	1167.7	1167.7	1159.1	1159.1
AAHUs for Target Species										5501.10

Evaluation Species Selection

The WHAG has a set number of aquatic and wetland species that was used by the study team to evaluate the perimeter water control dike and pumping facilities. Similarly, an upland community of birds and mammals was used to evaluate conversion of a portion of upland cropfields in the project area to warm season grassland and mast tree habitat. These species are an established set in the WHAG model. Although a set list of species has been used, each species represents a guild of other similar species that utilize the habitat in similar ways. In essence, each species represents an array of habitat variables for the species being evaluated. Table D- 8 lists the evaluation species used in this analysis. These species represent key management goals and objectives of the Rice Lake State Fish and Wildlife Area project.

TABLE D-8

Target Species Evaluated for Habitat Analysis

Species	Scientific Name	Habitat Evaluated
Channel catfish	*Ictalurus punctatus*	aquatic
Crappie	*Poxomis sp.*	aquatic
Largemouth bass	*Micropterus salmoides*	aquatic
Gizzard shad	*Dorosoma cepedianum*	aquatic
Carp	*Cyprinus carpio*	aquatic
Bluegill	*Lepomis macrochirus*	aquatic
Black bullhead	*Ictalurus melas*	aquatic
Mallard	*Anas platyrhynchos*	nonforested wetland
Canada goose	*Branta canadensis*	nonforested wetland
Least bittern	*Ixobrychus exilis*	nonforested wetland
Lesser yellowlegs	*Tringa flavipes*	nonforested wetland
Muskrat	*Ondatra zibethicus*	nonforested wetland
King rail	*Rallus elegans*	nonforested wetland
Green-backed heron	*Butorides striatus*	nonforested wetland
White-tailed deer	*Odocoileus virginianus*	upland (crop/grass/forest)
Wild turkey	*Meleagris gallopavo*	upland (cropland/forest)
Fox squirrel	*Sciurus niger*	upland (forest)
Dickcissel	*Spiza americana*	upland (grassland)
Wood thrush	*Hylocichla mustelina*	upland (forest)
Kentucky warbler	*Oporornis formosus*	upland (forest)
Eastern bluebird	*Sialia sialis*	upland (grassland/forest)
Bobwhite quail	*Colinus virginianus*	upland (crop/grass/forest)
Eastern cottontail	*Sylvilagus floridanus*	upland (crop/grass/forest)
Indigo bunting	*Passerina cyanea*	upland (grassland/forest)
Ring-necked pheasant	*Phasianus colchicus*	upland (crop/grassland)

a. Perimeter Water Control Dike and Water Level Management. Seven species were selected to evaluate the effect of proposed water control and water level management features on nonforested wetland habitat: Mallard and Canada goose are migratory waterfowl that utilize early successional wetland habitat and have socioeconomic importance as game species. The green-backed heron is a wading bird species found in midsuccessional herbaceous and shrub dominated habitat. The least bittern is a State listed endangered/threatened species that favors permanent, midsuccessional summer wetland habitat. Lesser yellowlegs is a migratory shorebird that favors initial successional wetland habitat (mudflats, waterlogged substrates). The king rail is a waterbird that utilizes midsuccessional, sedge dominated, permanent summer wetland habitat. The muskrat is a resident furbearing mammal found in midsuccessional herbaceous, permanent summer wetland habitat. These species were selected to analyze changes in habitat quality for a wide range of bird and mammal species, migratory and resident, game and nongame, common and rare, that utilize nonforested wetlands.

b. Fish Passage Structure. Seven species of fish were selected to evaluate the effects of this project feature on the quality of the backwater aquatic habitat: channel catfish, crappie, largemouth bass, gizzard shad, carp, bluegill, and black bullhead. This group represents a wide range of sport and commercial species commonly found in the project area.

c. Terrestrial Habitat Enhancement. A total of thirteen bird and mammal species were selected to evaluate the effects of conversion of a portion of the existing cropfield habitat to grassland and forest habitat. Species selected for evaluation include those which utilize only one of the habitat types (e.g. grassland) as well as those which use more than one habitat type. Mallard and Canada goose utilize cropfield habitats as feeding areas. White-tailed deer and wild turkey are game species that favor a diversity of habitats. The dickcissel is representative of species that are found in native grasslands. The eastern bluebird and the indigo bunting utilize grassland/forest edge habitat. The fox squirrel favors oldgrowth forest habitat with snag and cavity trees as well as mast producing tree species. Wood thrush and Kentucky warbler are species that are found in bottomland forest habitats. The bobwhite quail and eastern cottontail are game species that favor early successional habitats with an abundance of openland edge. Ringnecked pheasant utilizes cropland dominant habitats.

ASSUMPTIONS

Several assumptions have been made in regards to model performance, changes in habitat conditions over time, and future management practices.

a. Model Performance. The WHAG has been designed to be applied to many different types of habitat.

b. Changes in Habitat Conditions Over Time. Habitat conditions are not static. Either through natural processes or human activity, habitat evolves and may change in quality and/or quantity. Imbedded in each cover type evaluation, change has been added to the model. To assess the change over the period of analysis, target years have been defined. At each target year, a change in the habitat variables may be noticed. Noticeable changes can be characterized by a change in habitat benefit output.

Target years of 0, 1, 25, and 50 are sufficient to analyze HUs and characterize habitat changes over the estimated project life.

c. Future Management Use. It can be expected that there would be minor capital improvements made at Rice Lake that would have some effect on wildlife and human use. One assumption was that the integrity of existing water control structures would remain essentially the same over the 50-year project life. Another assumption was that current operating plans would remain in effect during that time, and that the current management objectives would remain in effect.

d. Habitat Use. The project would increase capability to manage water levels in the principle water bodies of the Rice Lake State Fish and Wildlife Area. While most evaluated species are selected to identify changes to just one habitat type, the nonforested wetland/shallow aquatic habitat in the project area is evaluated both as wetland that provides habitat to birds and mammals, and as backwater/overflow lakes that provide habitat for fish.

Forested wetland habitat was not evaluated in the WHAG analysis. Forested wetland is one of the major habitat types found in the Rice Lake State Fish and Wildlife Area (approximately 2,000 acres), and conservation of this habitat is one of the management objectives for the site. However, the primary goal of the HREP project is the enhancement of the quality of wetland habitat through increasing the success rate of emergent and moist soil vegetation, and providing reliable food and shelter for wildlife. Construction of proposed water level management features would require the permanent clearing of approximately 10 acres of bottomland hardwoods, mostly along the dike alignment. The variables used in the WHAG analysis are not sensitive enough to assess such small changes in habitat. Operation of water control features is not expected to adversely affect forested wetlands. Proposed normal pool elevations for both lakes (537.0 for Rice Lake and 536.0 for Big Lake) approximate the existing tree line and increased flooding of wooded areas is not anticipated. The ability to draw down the lakes during the majority of the growing season, and the increased protection from minor summertime flooding, could potentially improve conditions for bottomland timber.

e. Management Reliability (Probability of Successful Operation). Comparison of alternative combinations of features to increase water level management capability (perimeter dike and additional pumping/distribution facilities) was difficult to adequately evaluate through the WHAG analysis. The variables addressed in the WHAG matrix for nonforested wetland are not detailed enough to measure the differences in habitat outputs between the alternative levels of management capability. For this reason, the "future with-project condition" developed through the WHAG analysis reflects the projected outputs of the combination of features A2 (dike at elev. 442.0) and feature B2 (100,000 gpm pump station w/associated distribution channel system). In order to incrementally analyze the outputs and costs of all combinations of features, it was necessary to develop an alternative method of quantifying the benefits of combinations expected to provide smaller outputs than the A2 +B2 combination.

Successful water level management is dependent on the ability to manipulate interior water levels independent of river stages. The higher the level of protection, and the greater the capacity to manipulate water levels independent of Illinois River levels, the greater the probability of successful operation and the greater the reliability of meeting habitat needs of wetland species to achieve management objectives. The 1991 water control study conducted for the ILDNR by Crawford, Murphy, and Tilly (CMT) analyzed 41 years of river stage data to evaluate the probability (success rate) of meeting operational objectives for the site with different levels of water control capability. The results of the CMT analysis were used to derive a multiplier factor reflecting estimated reliability (expected success rate) for each combination of A and B features. The "reliability factors" applied to each A+B combination are listed below:

Combination	Reliability (% success)
A2+B2	1.00
A2+B1	0.74
A2+B0	0.51
A1+B2	0.46*
A1+B1	0.46*
A1+B0	0.46

* Because the CMT study did not evaluate a dike structure lower than elevation 439.0, their analysis did not include a projected success rate for a 438.0 level of protection (A1). It was therefore assumed that additional water level management capability (B1 or B2) would not produce additional outputs when combined with the A1 level of protection.

It should be noted that the reliability factor of 1.0 for the A2+B2 combination does not mean successful operation of the project in every year (i.e., 100% of the time). The level of protection afforded by a perimeter dike built to elevation 442, with improved pumping/distribution capability, was determined in the CMT study to have a probable success rate of 68%, or about 7 out of 10 years. The selected variables for the nonforested wetland matrix under with-project conditions assumed this expected success rate.

f. Design of Fish Passage Structure. The evaluation of aquatic habitat using the MOFISH overflow waters matrix assumed that the fish passage structure would be designed to facilitate fish egress from Rice Lake into deepwater areas of the Duck Island Gravel pit, and that this increased access would benefit the entire overflow waters area.

RESULTS

This section describes the HSI scores for each feature discussed in the main report. These features are the development of a perimeter water control dike; improved water level management capability through constructing a new pump station and associated distribution channels; constructing a fish passage structure between Rice Lake and the Duck Island gravel pit; and planting warm season grasses and mast producing trees on Duck Island to enhance terrestrial habitat. In each feature discussion, the no action, or without-project condition is also discussed.

a. Perimeter Water Control Dike. The successful management of the Rice Lake SFWA for migratory birds is dependent on the reliable production of a seasonal food source. The key to achieving this objective lies in the ability to accomplish a late spring drawdown to expose mudflats and promote the growth of annual vegetation that is protected from flooding until after the growing season, coupled with the capacity to reflood the area during fall migration and manipulate water levels as needed to meet management goals (e.g., mudflats for shorebirds vs. 2-foot water depths for dabbling ducks). The addition of a perimeter water control dike to the project area is essential to achieve any degree of improved water level management. This feature includes a spillway structure and a gravity flow outlet for water level control.

Quality of existing wetland habitat would be raised by improving the ability to maintain interior water levels to promote waterfowl food plant production and provide feeding areas during migration periods. The results of the analysis show positive impacts for all evaluated species, particularly those which utilize moist soil vegetation as a food source (mallard and Canada goose) or require stable water levels (king rail).

(1) Dike at Elevation 440.0 (A1). The earth segment of the perimeter water control dike would be constructed to a minimum top elevation of 440.0 (Part of the northern portion of the alignment exceeds this elevation). The spillway structure would be constructed with a crest elevation of 438.0. This alternative would protect the Big Lake area from minor fluctuations in Illinois River levels up to elevation 438.0 during the summer drawdown. Drawdown and reflooding of the Big Lake area would be accomplished by gravity flow and would be dependent on favorable river stage conditions. This alternative undertaken alone would not increase management reliability of the Rice Lake portion of the project area, since the Rice Lake spillway crest is at elevation 439.0, a foot higher than the perimeter dike spillway crest.

(2) Dike at Elevation 442.0 (A2). The earth segment of the perimeter water control dike would be constructed to a minimum top elevation of 442.0 (Some areas along the northern portion of the alignment already meet or exceed this elevation). The spillway would be constructed with a crest elevation of 440.0. This alternative would protect the Big Lake area from Illinois River fluctuations up to elevation 440.0 and would provide some additional protection to the Rice Lake area as well. Drawdown and reflooding of the Big Lake area would be accomplished by gravity flow under favorable river stage conditions. This alternative would provide greater management reliability than alternative A1, but flexibility would still be constrained by dependence on gravity flow to manipulate water levels.

b. Improved Water Level Management Capability. As discussed in paragraph (e) of the Assumptions, the probability of achieving the operational goals of the project is dependent not only on the ability to maintain desired water levels in Big Lake and Rice Lake, but also on the ability to manipulate those water levels, independent of Illinois River stages. Additional pumping capacity and associated distribution channels (conveyance ditches) would provide the management flexibility needed to reliably achieve project goals and objectives.

Additional pumping and distribution capacity would provide greater management flexibility for the entire project area, and would further improve habitat quality by increasing the success rate for the operational plan.

(1) New Pump Station and Distribution System (50,000 gpm Capacity). This alternative would involve construction of a new pumping station with a capacity of 50,000 gpm on the Illinois River near the old Copperas Creek lock, and excavation of distribution channels to move water between the river and Big Lake. This alternative would provide the capability to drawdown and reflood the Big Lake area to achieve desired water levels when Illinois River stages would prevent such manipulation by gravity flow. The existing pump station would continue to be operated and maintained to manage water levels in the Rice Lake area.

(2) New Pump Station and Distribution System (100,000 gpm Capacity). This alternative would involve construction of a new pumping station with a capacity of 100,000 gpm on the Illinois River near the old Copperas Creek lock, and excavation of distribution channels to move water between the river, Big Lake, and Rice Lake. This alternative would provide the capability to drawdown both the Big Lake area and the Rice Lake area, to achieve desired water levels when Illinois River stages did not permit manipulation by gravity flow. This existing pump station would no longer be operated and maintained to manage water levels in the Rice Lake area.

c. Terrestrial Habitat Enhancement. This feature would involve converting a portion of the cropfield habitat on the Duck Island peninsula to other vegetation to provide a diversity of cover types. Although Duck Island lies entirely within the 100-year floodplain, most of the peninsula is slightly higher in elevation than the surrounding lands of the Rice Lake State Fish and Wildlife Area. The relatively higher topography of Duck Island provides conditions suitable for the reintroduction of native floodplain and mesic plant species less tolerant of frequent flooding than those which are currently common in the project area.

(1) <u>Warm Season Grass Planting (200 Acres)</u>. This alternative would convert 200 acres of cropfield on Duck Island to grassland habitat by planting a mixture of warm season grasses such as big bluestem (*Andropogon gerardii*), Little bluestem (*Schizarchyrium scoparium*), Indian grass (*Soprghastrum nutans*) sideoats gramma (*Bouteloua curtipendula*), and perennial rye grass as a cover crop. Because of the value of cropfields as feeding habitat for certain game species, the conversion to grassland negatively affected habitat values for four of these species: mallard, Canada goose, white-tailed deer, and ring-necked pheasant. However, habitat values for five of the evaluated species (wild turkey, dickcissel, eastern bluebird, bobwhite quail, and eastern cottontail) would be enhanced by this alternative.

(2) <u>Warm Season Grass Planting (200 Acres) and Mast Tree Planting (100 Acres)</u>. This alternative would add to the warm season grass planting described in (1) above, the conversion of an additional 100 acres of cropfield habitat to bottomland, mast dominant, hardwood forest. Five species of native mast-producing trees (pin oak, bur oak, swamp white oak, pecan, and sycamore) would be planted in the conversion area. Because mast tree species can take several decades to reach maturity, most benefits calculated through the WHAG analysis occur after year 25. The increased diversity of cover types and food sources on Duck Island will benefit a large number of both game and nongame species, including. This added diversity offsets the negative effects to habitat values for the four species listed in (1) above.

d. <u>Fish Passage Structure</u>. This alternative involves placement of a 60-inch-diameter gated structure between Rice Lake and the Duck Island gravel pit. Fish carried into Rice Lake during flood events become trapped in the shallow waters once the river recedes. Late spring drawdowns to encourage growth of moist soil plants frequently result in fish kills. Construction of the structure would allow fish to escape to the deeper waters of the quarry during the drawdown phase as well as overwinter in the quarry pits when the rest of the lake waters are frozen. The results of the WHAG analysis showed positive effects to all evaluated fish species.

Although not addressed through the WHAG analysis, providing refugia for fish in Rice Lake could potentially have secondary benefits to waterfowl. Decomposing fish serve as a host for maggots producing the toxin that causes avian botulism. Improving fisheries habitat is expected to decrease the incidence of fish kills and therefore could potentially reduce outbreaks of avian botulism.

DISCUSSION

The results of the HEP analysis appear to confirm that Rice Lake is a functioning wetland complex, but can be enhanced with the features proposed for this project. Results of the HEP application were compared as increments to costs where applicable. The incremental analysis is discussed in Section 7 (Formulation of Alternatives) of the main report.

The proposed project for Rice Lake involves four primary enhancement features: perimeter water control dike construction, improved water level control (pumping and distribution capability), warm season grass and mast tree planting on Duck Island, and construction of a fish passage structure. As explained in the text of the main report, establishment of the perimeter water control dike is an essential starting point for implementation of these features. Thus, the incremental cost analysis evaluated the perimeter water control dike (two alternative heights) by itself and in combination with the two water control options, two terrestrial planting options, and the fish passage structure.

In conclusion, the WHAG analysis indicates that the higher level water control dike, coupled with the improved water level management capability, the combined grassland/mast tree planting feature, and the fish passage culvert would provide the greatest outputs in the most cost-effective manner. This combination would allow the ILDNR site manager optimal management flexibility conditioned on the level of flood protection provided by the perimeter dike, would add to habitat diversity as well as quality, and would best meet the overall management objectives for the site.

GEOTECHNICAL CONSIDERATIONS

A P P E N D I X E

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17D)

RICE LAKE STATE FISH AND WILDLIFE AREA
HABITAT REHABILITATION AND ENHANCEMENT

LA GRANGE POOL, ILLINOIS WATERWAY
MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

APPENDIX E
GEOTECHNICAL CONSIDERATIONS

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APPENDIX E
GEOTECHNICAL CONSIDERATIONS

PURPOSE AND SCOPE

This appendix presents the general geology and specific geotechnical analysis pertinent to the project. The geological information contained in this report has been collected from various sources, including publications from the Illinois State Geological Survey and the U.S. Army Corps of Engineers. Additional soils information was obtained from a pre-published county soil survey obtained from the Department of Natural Resources in Fulton County. Geologic information was obtained from publications produced by the Illinois State Geological Survey. Detailed soils information was obtained from borings collected under the direction of the Rock Island District, U.S. Army Corps of Engineers, who also performed the laboratory interpretation of the samples.

DESCRIPTION OF PROJECT GEOTECHNICAL FEATURES

WATER DISTRIBUTION CHANNELS

A fairly elaborate network of distribution channels is proposed for this project. Figure E-1 shows the proposed cross sections for the interior channels. The channels will be used to fill and lower both Rice Lake, Big Lake, and the Moist Soil Management Units. The network consists of both new and existing drainage channels. The deepest section of the channel will consist of cut sections that are approximately 12 feet below the existing ground surface and small embankments approximately 2 feet above the existing ground surface. Shallow sections of the drainage channels will contain embankments that are approximately 4 feet above the existing ground and ditches that are 8 feet below existing ground.

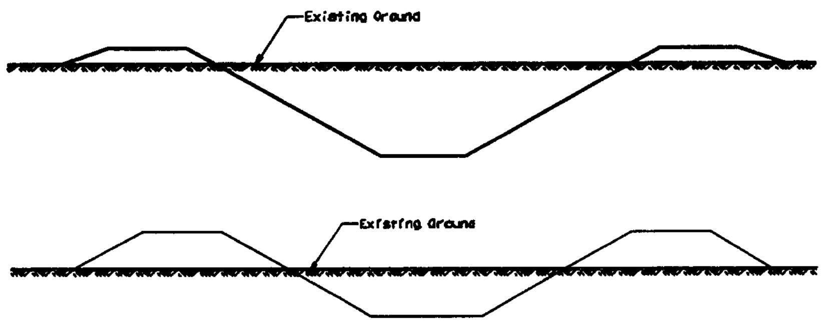

Figure E-1. Interior channel cross section.

IMPROVEMENT OF HATE LEVEE

On the south end of Goose Lake, the existing Hate Levee will be improved to elevation 442. The new and improved embankment will contain an overflow section at elevation 440 that will allow the protected area to be completely filled with water during high water events. This will prevent significant flows over the non-overflow sections of the embankment during periods of flood. When the levees are overtopped, water levels will be equal on both sides of the levee, and flow velocities over the levees will be relatively slow. The improved embankment shall be approximately 6 feet high at its maximum height.

The proposed structure of the Hate Levee will consist of a core constructed of dredged sand with topsoil placed over the sand. Placing the topsoil over the sand will cause significant pore pressures to develop in the soil at the interface of the topsoil and the sand. The slopes could become unstable if the pore pressures are not accounted for in the design.

CONNECTION OF GRAVEL PIT TO RICE LAKE

The proposed connection between Rice Lake and the Gravel Pit on Duck Island will consist of a tube that will run through the narrow strip of land and connect the two bodies of water. A 60-inch-diameter tube will be used to make the connection. The invert elevation will be approximately elevation 432, which is 15 feet below the existing surface.

NEW PUMP STATION LOCATED NEAR OLD LOCK CHAMBER

A new pump station that will control the water levels inside the project will be located near the old Copperas Creek lock chamber. Borings were taken at proposed locations to describe the foundation material present.

LOCATION

The Rice Lake EMP is located in Fulton County, Illinois, south of Banner, Illinois. The site borders the Illinois River from approximately River Miles 132 to 138.

PHYSIOGRAPHY

The project area is situated within the Dissected Till Plains Section of the Central Lowlands Province of the Interior Plains. The project area has little topographic relief and consists of shallow backwaters, bottomland, and islands that are subjected to permanent high water tables and annual flooding.

GEOLOGY

Except for Duck Island, the entire Rice Lake project area falls on a deposit called the Cahokia Alluvium. Alluvium is river deposited material generally consisting of clayey silt and sandy silt with lenses of silty sand and gravel. The thickness of the deposit is generally less than 40 feet in the Illinois River Valley but may be up to 60 feet deep in some locations. Directly below the alluvial material lies bedrock that is Pennsylvanian in age. The bedrock consists of layers of limestone, shales, and sandstones. The bedrock has a slight dip in the southeast direction of about 15 feet per mile.

SURFICIAL SOILS

The United States Department of Agriculture (USDA) publishes soil surveys for most counties in the United States. Information contained in these reports pertains to soil within 5 feet of the surface. Soils are mapped by soil series. A soil series is a group of soils having profiles that are almost alike (in the upper 5 feet). All soils of a series have horizons that are similar in compositions, thickness, and arrangement (in the upper 5 feet). Information in a pre-published soil survey indicated that the types of soils that are present in and around Rice Lake generally fall in to the Beaucoup soil series. Duck Island surficial soils fall into a different series that is not discussed in the pre-published survey. The Beaucoup soil series is described as a silty clay loam in the USDA classification system. Generally, soils in the upper 35 inches of the profile classify as low plasticity clay (CL) in the Unified Classification system. Soils from 35 to 60 inches in depth classify as CL and CL-ML (low plasticity silt). The water table is said to vary from 0.5 foot above the ground surface to 2 feet below the ground surface. This soil series is frequently flooded.

Except for Duck Island, surficial soils of Rice Lake are fine-grained soils with over 80 percent passing the number 200 sieve. The soils generally classify as CL or ML in the Unified Classification System. Clay contents range from 15 percent to 35 percent. Soils on Duck Island contain more sand-sized material than the rest of the Rice Lake EMP site.

SUBSURFACE EXPLORATIONS

The Rock Island District conducted an extensive subsurface exploration to characterize the composition and engineering properties of soils present at Rice Lake. Borings were taken at locations shown on plate 4 of the Definite Project Report. Logs were created of each hole and are shown on plates 5 and 6.

On each boring, samples were taken at sufficient intervals to classify all the strata encountered. Resistance to drive the split spoon sample was measured and recorded. Representative samples were taken for visual classification, compaction testing, and Atterberg limits on enough samples to verify classifications.

Borings RL-96-1 through RL-96-6 were used to characterize the foundation conditions at two proposed pump station locations. Three borings were taken at each alternative. For each alternative, one boring approximately 50 feet deep was located at the proposed pump station site, one boring 50 feet deep was taken at the proposed head gate section, and one boring approximately 25 feet deep was taken between the head gate and pump station.

Borings RL-96-7 though RL-96-18 were used to identify soils and foundation conditions for the proposed filling and drainage channels. Borings were approximately 25 feet deep, which made the bottom of the boring about 3 to 5 feet below the proposed bottom of the channel. Generally, the borings were taken approximately every 1,000 feet along the proposed alignments. Additionally, 50-foot-deep borings were taken at proposed water control structures.

Borings RL-96-18 through RL-96-23 were hand-auger borings taken from a boat to verify material types that have been deposited in the existing channel.

Borings RL-96-26 through RL-96-32 were taken at 1,000-foot intervals along the Hate Levee. The borings were approximately 10 feet deep and were used for a slope stability and underseepage analysis of the proposed levee.

Boring RL-96-34 is located at a proposed connection between Rice Lake and the Gravel Pit. Boring RL-96-33 is located at the proposed closure between Big Lake and the Gravel Pit.

COMPACTION TESTING

Standard Proctor compaction testing was performed on samples obtained from both the upper and the lower ends of Rice Lake. Samples from the upper end were combined to develop one curve, and samples from the lower were combined to develop another curve. Both samples produced similar results. DPR plates 5 and 6 show the results from the compaction testing. The optimum densities on each of the tests were 101 and 105 lbs for the lower sample and upper sample, respectively. The optimum moisture content for both samples was around 20 percent. The *in situ* water contents of the soils are closer to 30 or 40 percent. Based on the proctor curves developed in the lab, the 30 percent moisture content will yield a density about 90 percent of the maximum density. If fills on the project are to be fully compacted, then extensive measures will have to be taken to dry materials, which is often time consuming and expensive. Therefore, fill material will be placed at natural moisture content and compacted with controlled movement of spreading and hauling equipment or a certain number of passes with a sheeps foot and/or rubber-tired rollers.

The strength parameters selected for analysis will be based upon semi-compacted fill materials. Therefore, conservative values of analysis will be used.

STABILITY OF INTERIOR CHANNELS

The stability of the embankments was analyzed in accordance with EM 1110-2-1913 "Design and Construction of Levees." The UTEXAS-3 computer program was used to analyze the embankments and cuts proposed on the project. Both interior channels and the Hate Levee were analyzed for stability.

GEOMETRY

Both the deep and the shallower channel sections were evaluated for stability. Borings RL-96-7 through RL-96-18 showed that the depth to sand varied between 15 and greater than 30 feet in depth. The soil profile was simplified to two conditions. One condition was modeled with soil profile shown in

Figure E-2. In this profile, the sand is shallow at 15 feet below the surface. The second condition was modeled with the depth of the clay extending to approximately 30 feet and then the sand would begin. It is believed that sand any deeper than this would have no bearing on the stability of the interior channels.

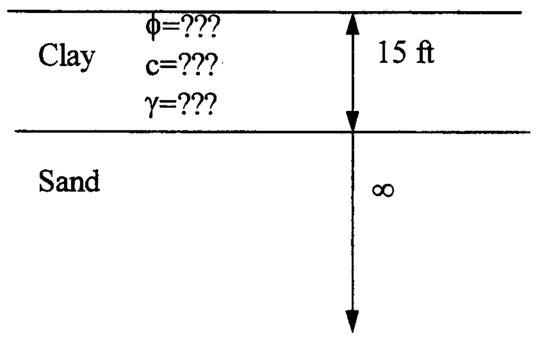

Figure E-2. Profile analyzed for interior channels.

LOADING CONDITIONS

EM-1110-2-1913 suggests that five different loading conditions be analyzed. Table E-1 below shows the cases that were analyzed for this project. Preliminary analysis indicated that the End of Construction (Case 1) and Rapid (or Sudden) Drawdown (Case 2) were the most critical design conditions. Slopes designed for Cases 1 and 2 would also be stable under the other design conditions. The earthquake loading was not analyzed because the probability of a serious earthquake is low in this area and the soil's susceptibility to liquefaction is low.

TABLE E-1

Suggested Loading Conditions in EM 1110-2-1913

Case No. [a]	Design Condition	Slope Analyzed	Shear Strength	Minimum Factor of Safety
I(I)	End of construction	Riverside and landside [b]	Q or S [c]	1.3
II(II)	Sudden drawdown	Riverside	S where < R R where < S [d]	1.0
III(IV)	Intermediate river stage	Riverside	S where < R (R + S)/2 where R < S [d]	1.4
IV(V)	Steady seepage from full flood stage	Landside	S where < R (R + S)/2 where R < S [d]	1.4
IV(VII)	Earthquake: Cases I, III, and IV with seismic loading	Riverside and landside	[e]	1.0

a Number in parentheses are corresponding cases described in paragraph 1-1x of EM 1110-2-1902 (ref. A-3a (4)).
b If high water can occur while this case applies, the additional increase in driving forces due to the water must be included in analyzing the landside slope.
c In zones where no excess pore water pressures are anticipated, use S strength.
d Composite shear strength envelope.
e Use shear strength applicable for case analyzed.

SELECTION OF SHEAR STRENGTH PARAMETERS

Strength parameters are major inputs to a slope stability analysis. The strength parameters are described as a ϕ, and c. ϕ is the angle of internal friction and c is the cohesion. Equation 1 below describes the shear strength.

$$S = c + \sigma \tan\phi$$

Equation 1

where: S = shear strength in (psi)
c = cohesion (psi)
σ = normal stress (psi)
ϕ = angle of internal friction

For the fine-grained soils, Figure 3-7 in EM 110-2-1913 shows a correlation between Plasticity Index (PI) and ϕ and the correlation between ϕ and the c/p ratio where p is the previous maximum overburden pressure. Figure E-3 below shows Figure 3-7 from EM 110-2-1913. The undrained shear strength was determined from a correlation published by the Virginia Polytechnic Institute in a document titled, *Shear Strength Correlations for Geotechnical Engineering*. The correlation relates undrained shear strength to the blow counts and PI and is shown in Figure E-4.

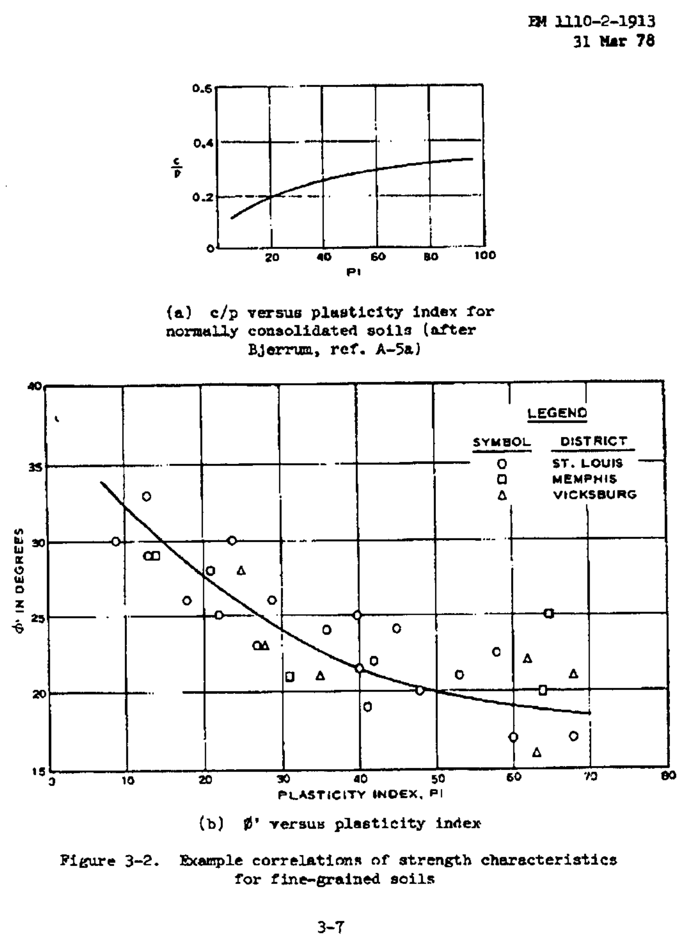

Figure E-3. Figure from EM 1110-2-1913 used to estimate drained phi and c.

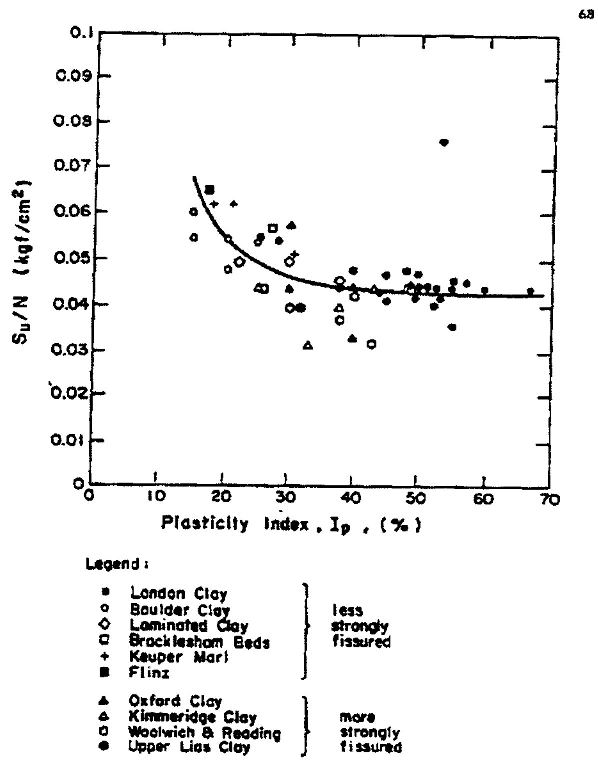

Fig.32 The Variation of S_u/N with Plasticity Index, Ip, (After Stroud, 1974).

Figure E-4. Used to estimate undrained shear strength of soils.

For the cohesionless soils, c was assumed to be zero. The angle of internal friction was estimated based upon Figure 3-5 in EM 1110-2-1913, which is shown below in Figure E-5.

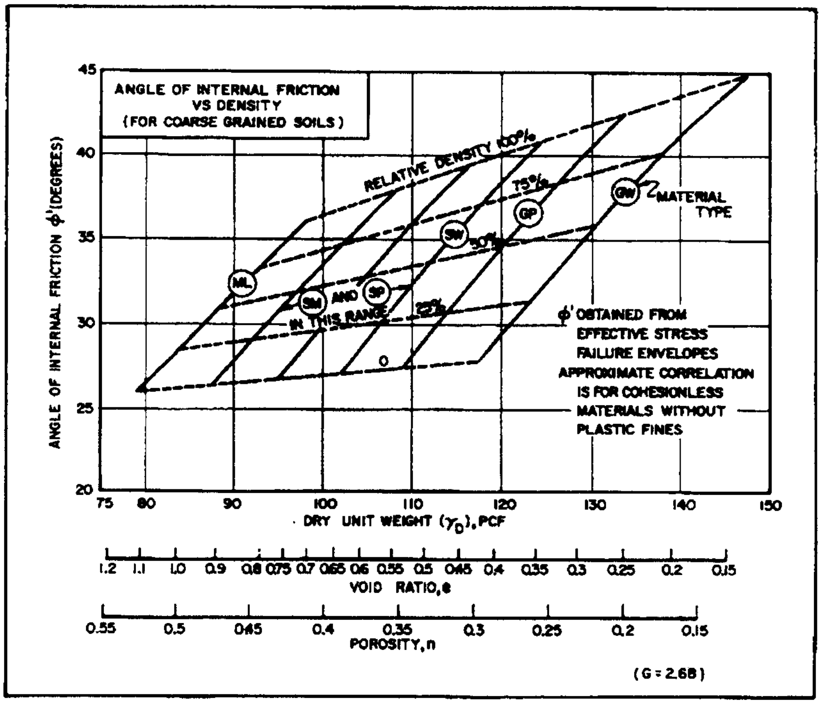

FIGURE 7
Correlations of Strength Characteristics for Granular Soils

Figure E-5. Used to estimate angle of internal resistance for cohesionless soils.

As shown in Table E-2, the standard penetration resistance ranged from 0 to 7 in the first 15 feet of depth for the soils. For design, the penetration resistance was selected to be 4. Also from the log, the Plasticity Index (PI) ranged from 17 to 44. For design, a PI of 30 was selected. Using Figure E-4, the undrained shear strength for design was selected to be 400 pounds per cubic foot (pcf).

TABLE E-2

Average Blow Counts Values for Interior Drainage Channels

	Penetration Rate -N (Blows/Foot)										
Depth	RL-96-7	RL-96-8	RL-96-9	RL-96-10	RL-96-11	RL-96-13	RL-96-14	RL-96-15	RL-96-16	RL-96-17	RL-96-18
0											
2.5	2	2	6	6	7	3	6	3	5	2	5
6	3	2	4	5	4	4	5	7	5	4	4
8	3	0	3	2	5	5	4	7	3	5	7
11	5	0	4	2	5	5	4	4	4	3	5
13	2	3	4	3	2	2	5	2	3	4	3
14	4										
AVG	3	1	4	4	5	4	5	5	4	4	5
Total Average											4

The drained strengths of the material were selected using Figure E-3. Using the upper part of Figure E-3 with a design plasticity of 30, the c/p ratio was determined to be 0.225. The assumed overburden pressure was assumed to be 450 psf. (7.5 * (120-62.4)). Therefore, the estimated drained cohesion is determined to be approximately 100 psf. Using the lower part of Figure E-3, the drained phi was estimated to be 22.5 degrees.

It was felt that the stability of the structure was more dependent on the strength of the clay than the shear strength of the sand. Therefore, a conservative 30 degrees was selected of the ϕ of the sand. Most sand will have higher values of ϕ, but this was sufficient for the designs in this project. In the cases analyzed, the failure plane never passed through the sand. Therefore, the strength of the sand did not affect the factor of safety calculated.

Since the strength inputs were determined from correlation, the actual conditions could vary considerable from the estimated values. Therefore, a sensitivity analysis was performed to determine the sensitivity of proposed structures to design inputs.

RESULTS OF SLOPE STABILITY ANALYSIS

DPR plates 6 and 7 show the graphical results of the slope stability analysis. The tabular results are shown below.

TABLE E-3

Results Summary of Slope Stability Analysis

	Required Factor of Safety	Minimum Calculated Factor of Safety	
		2.5:1 Slopes	3:1 Slopes
End of Construction	1.3	1.42	1.45
Rapid Draw Down	1.0	0.99	1.12

The minimum factors of safety calculated from the slope stability analysis are shown in TABLE E-3. The 2.5H to 1V slopes on the deep slopes have a marginal factor of safety for the rapid drawn case in the deep sections. These slopes may be susceptible to erosion and will require more maintenance.

The required factor of safety for the rapid drawdown analysis is determined in EM 1110-2-1913. This factor of safety assumes that the rapid drawdown is not going to occur often or the rapid drawdown is unlikely. With the interior channels, especially near the pump station, the rapid drawdown will likely be a common occurrence. Therefore, the required factor of safety may need to be slightly higher to ensure the stability of the slopes.

Considering this, the recommended maximum slopes for the interior channels should be 3H:1V.

STABILITY OF HATE LEVEE

The proposed structure of the improved Hate Levee consists of a dredged sand core with topsoil placed on top to promote vegetation growth. This is an unusual structure that requires some specific design considerations.

Borings RL-96-26 through RL-96-29 indicate that clay layers extend to depths of approximately 20 feet (elevation 420+/-). This would indicate that underseepage would not be a problem for the Hate Levee.

The Hate Levee was designed to account for the sand core in the levee. The topsoil will extend to the toe of the levee. Figure E-8 shows the cross section analyzed with the computed phreatic line shown. FASTSEEP Version 3.0 was used to determine the phreatic line. Inputs for the FASTSEEP model include geometry of the section that is shown in Figure E-8 and the permeability (k) of the soils. Permeabilities used for the analysis were 100 ft/day and 1 ft/day for the sand and topsoil, respectively. The cross section of the levee was varied until the pore pressures were not significant enough to force the topsoil off the landside of the levee. This was determined to be the minimum allowable cross section for this system.

Figure E-8 shows the minimum allowable cross section for the Hate Levee. This assumes that the levee core will consist of dredged sand. The recommended slopes should be no steeper than 5H:1V on both sides of the slope. At different times of the year, either side of the levee could impound water. The thickness of the topsoil on the Hate Levee will be at least 2 feet thick to ensure stability of the topsoil on the slopes.

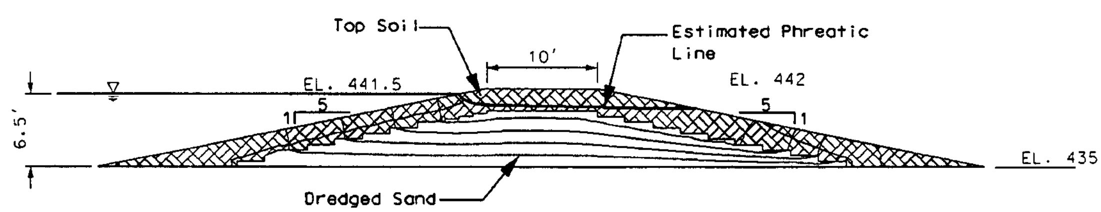

Figure E-8. Minimum cross section for improved Hate Levee.

EXCAVATION AT PUMP STATION

Borings RL-96-1 through RL-96-6 show the soil profile for the proposed pump station structures. RL-96-1 and RL-96-4 are located at proposed locations of the pump stations. RL-96-2 and RL-96-5 are located at the midpoint between the headgate and the pump station. Borings RL-96-3 and RL-96-6 are located at proposed pump stations.

Borings RL-96-1, RL-96-2, and RL-96-4 indicate that fine sands are present in the upper six feet of the soil. Under the sand layers, relatively soft clay layers are found which extend to approximately elevation 420. Then, sands and clayey sands are found until the bottom of the borings. Borings RL-96-3, RL-96-5, and RL-96-6 indicate lean clays until approximately elevation 420. Below, fine sands and clayey sands extend to the bottom of the boring. The borings indicate that the water table is within 5 feet of the surface.

While excavation for the structures will require no special equipment, precautions will have to be taken to maintain stable excavation slopes and a dewatered excavation. This may include shoring and/or pumping.

EXCAVATION FOR CONNECTION OF GRAVEL PIT TO RICE LAKE

Boring RL-96-34 was taken at the proposed location of the connection between Gravel Pit and Rice Lake. Above elevation 430, the soil profile generally consists of sands, sandy clays, and clayey sands. Below elevation 430, the profile consists entirely of sands. Open excavation will require a dewatering system. Additionally, a temporary construction shoring will be required for the excavation of the culvert between the two lakes.

RECOMMENDATIONS

It is recommended that features adhere to the minimum requirements for slopes outlined in the above document.

- Interior Channels: Slopes should consist of 3H to 1V. Embankments should have 3H to 1V slopes with 10-foot minimum crown widths. Embankment material should consist of cohesive soils from the adjacent cut sections.

- Hate Levee: The crown width should be 10-foot minimum. Slopes shall be at least 5H to 1V. The topsoil shall be cohesive soils at least 2 feet thick. The core of the levee will be constructed of hydraulically dredged sand.

- Excavations for structures will be able to be accomplished using conventional construction methods. Precautions will be required to assure stable and dewatered excavations at some locations.

REFERENCES

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WATER QUALITY

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**UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17D)**

**RICE LAKE STATE FISH AND WILDLIFE AREA
HABITAT REHABILITATION AND ENHANCEMENT**

**LA GRANGE POOL, ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS**

APPENDIX F
WATER QUALITY

PURPOSE

The purpose of this appendix is to discuss the results of baseline water quality monitoring performed at Rice Lake. Water quality monitoring was performed in an effort to define present water quality conditions and to identify potential problem areas.

GENERAL

Water quality at Rice Lake is dominated by the shallow nature of the lake coupled with lake management practices. Typically, during the summer months the lake is drawn down to allow for the production of moist soil vegetation which is utilized as a food source by waterfowl. This often results in fish kills.

Preliminary discussions regarding the Rice Lake project called for construction of several islands throughout the complex for the purpose of improving water quality by reducing the resuspension of sediments due to wave action. In response to this proposal, a water quality monitoring program was implemented. Beginning in May1987, Rice Lake water quality was monitored at site W-I135.4B. The location of this site is shown in the monitoring plan (see plate 16 of the main report). As the project evolved, it was determined that island construction was no longer a feasible alternative; therefore, the water quality component was dropped from further consideration. The final sampling event occurred on February 15, 1994.

METHODS

Corps of Engineers Water Quality and Sedimentation Section personnel collected samples on December 20, 1991; February 1, 1993; and February 15, 1994. Daily and Associates, Engineers, Inc., Peoria, Illinois, collected the remaining samples under contract to the Corps. On each sampling event, a water sample was collected just below the surface. Samples requiring laboratory analysis were placed on ice. Samples collected by Daily and Associates, Engineers, Inc., were analyzed by their in-house laboratory, while Corps samples were shipped to ARDL, Inc., Mt. Vernon, Illinois, for analysis. Turbidity and alkalinity samples collected by the Corps were analyzed in-house. Sample collection/preservation and field/laboratory analytical procedures were performed according to the American Public Health Association, *et al.* (1985, 1989 or 1992) or the U.S. Environmental Protection Agency (1983). Sampling date, time, water depth, Secchi disk depth, water velocity, wave height, air temperature, percent cloud cover, wind speed and direction, pH, water temperature, dissolved oxygen (D.O.) and conductivity were recorded in the field.

In general, quality control procedures for the number of field duplicates, replicate analyses, spiked samples, control samples, and blanks run followed the guidelines of the U.S. Environmental Protection Agency (1979) or U.S. Environmental Protection Agency (1986).

RESULTS AND DISCUSSION

The results from baseline water quality monitoring at Rice Lake site W-I135.4B are given in Table F-1. Sampling commenced on May 27, 1987, and ended on February 15, 1994. The sampling site was often inaccessible during the summer months when the lake was drawn down.

The results from pH and D.O. measurements were compared against Illinois General Use Water Quality Standards. The acceptable pH range is 6.5 through 9.0. Values outside this range are acceptable when they are due to natural causes. Five pH values exceeded the maximum of 9.0; however, all appear to be due to natural causes. In each instance, D.O. and chlorophyll *a* concentrations were also relatively high, indicating the high pH values were probably a result of algal photosynthesis. The Illinois General Use Water Quality Standards state that D.O. concentrations shall not be less than 6.0 mg/l during at least 16 hours of any 24-hour period, nor less than 5.0 mg/l at any time. A review of the data indicates the D.O. concentration was below 5.0 mg/l on four occasions: July 10, 1990 (4.60 mg/l), September 7, 1990 (4.10 mg/l), October 17, 1990 (0.90 mg/l) and May 27, 1992 (0.40 mg/l). A combination of below average chlorophyll *a* concentrations, heavy cloud cover and early sampling time appear to be responsible for the low D.O. concentrations. On all four sampling days the chlorophyll *a* concentration was below the average value of

137.7 mg/m^3, with the highest concentration being 56 mg/m^3 on October 17, 1990. The cloud cover on July 10 and September 7, 1990 was 100 percent. Except for the September 7 sampling event, the sampling time was at or before 8:10 a.m.

Suspended sediment concentrations at Rice Lake were relatively high, averaging 62.60 mg/l. This is probably a result of resuspension of bed sediments due to wind-generated waves, with high algal concentrations also being a contributing factor.

CONCLUSIONS

Baseline water quality monitoring studies at Rice Lake have shown that on occasion, pH values exceed 9.0 and dissolved oxygen concentrations fall below 5 mg/l. Periodic extreme plant photosynthesis/respiration would appear to be the primary factors contributing to these events. The shallow nature of the lake coupled with the aquatic vegetation present most likely result in wide swings in pH values and D.O. concentrations during a typical summer day. A combination of resuspended bed material and algal biomass appears to be the factor resulting in the lake's relatively high suspended solids concentration.

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Table F-1. Water quality monitoring results from samples collected at site W-I135.4B

DATE	WATER DEPTH (FT)	VELOCITY (FT/SEC)	WAVE HEIGHT (FT)	AIR TEMP. (°C)	CLOUD COVER (%)	WIND SPEED (MPH)
5/27/87	4.80	-	-	29	-	15
6/9/87	4.80	-	-	23	-	10
6/23/87	3.30	-	-	27	-	5
7/7/87	1.90	-	-	29	-	10
9/15/87	1.60	-	-	24	-	0
9/30/87	2.60	-	-	21	-	10
10/13/87	2.50	-	-	16	-	5
10/27/87	3.10	-	-	8	-	5
6/26/90	9.00	0.380	0.3	26	90	2
7/10/90	7.00	0.400	0.2	27	100	2
7/25/90	7.00	0.060	0.8	26	10	8
8/8/90	5.00	0.120	0.0	26	40	2
8/23/90	4.50	0.580	0.2	24	100	2
9/7/90	5.50	0.040	0.8	28	100	8
9/19/90	4.00	-	0.5	18	100	5
10/2/90	4.00	0.030	0.5	28	0	2
10/17/90	3.50	0.270	1.0	19	25	10
10/30/90	4.00	0.250	0.5	22	0	8
5/21/91	7.00	0.140	0.2	27	100	3
6/5/91	8.00	-	2.0	26	0	20
6/18/91	5.00	0.070	0.2	29	5	3
7/1/91	2.00	0.150	0.5	29	5	8
12/20/91	3.80	0.047	0.0	0	100	0
5/12/92	3.00	0.110	0.5	31	80	2
5/27/92	4.00	-	0.5	10	0	2
6/9/92	3.00	-	0.5	30	80	8
8/5/92	2.00	0.020	0.5	27	95	8
2/1/93	10.00	0.152	*	3	0	2
2/15/94	4.60	0.045	*	3	5	8
MIN	1.60	0.020	0.0	0	0	0
MAX	10.00	0.580	2.0	31	100	20
AVG.	4.50	0.168	0.5	22	49	6

* Not applicable, ice cover

Table F-1 (Cont.). Water quality monitoring results from samples collected at site W-I135.4B

DATE	WIND DIRECTION	WATER TEMP. (°C)	DISSOLVED OXYGEN (MG/L)	pH (SU)	TOTAL ALKALINITY (MG/L as CaCO3)
5/27/87	SW	24.0	14.00	9.40	-
6/9/87	NE	25.0	10.50	9.50	-
6/23/87	NE	32.0	7.10	9.30	-
7/7/87	SW	27.0	11.50	9.20	-
9/15/87	-	23.0	7.70	8.20	-
9/30/87	NW	21.0	11.50	8.90	-
10/13/87	SW	11.0	12.40	9.00	-
10/27/87	SW	9.0	13.00	9.00	-
6/26/90	SW	24.0	6.70	7.95	170
7/10/90	NW	23.0	4.60	8.39	170
7/25/90	S	26.0	12.60	8.60	180
8/8/90	S	29.0	15.80	8.78	180
8/23/90	SE	25.5	6.40	8.40	190
9/7/90	NW	30.0	4.10	8.14	200
9/19/90	N	18.0	8.60	8.53	200
10/2/90	SE	21.0	7.40	8.56	190
10/17/90	S	16.6	0.90	8.37	180
10/30/90	SW	13.3	9.50	8.71	240
5/21/91	SE	24.0	16.80	8.60	140
6/5/91	N	26.0	8.80	8.70	150
6/18/91	NW	28.0	15.40	9.00	170
7/1/91	SW	32.0	13.30	9.30	150
12/20/91	-	3.2	16.24	8.85	145
5/12/92	N	27.0	12.70	8.40	110
5/27/92	N	16.0	0.40	7.90	180
6/9/92	NE	27.0	14.00	9.00	150
8/5/92	N	23.0	5.90	8.80	120
2/1/93	N	4.2	17.11	8.74	155
2/15/94	NW	4.8	18.82	8.05	70
MIN	-	3.2	0.40	7.90	70
MAX	-	32.0	18.82	9.50	240
AVG.	-	21.2	10.47	-	164

Table F-1 (Cont.). Water quality monitoring results from samples collected at site W-I135.4B

DATE	SPECIFIC CONDUCTANCE (µMHOS/CM @ 25°C)	SECCHI DISK DEPTH (FT)	TURBIDITY (NTU)	SUSPENDED SOLIDS (MG/L)
5/27/87	510	0.70	-	92.00
6/9/87	520	0.50	-	71.00
6/23/87	530	0.50	-	57.00
7/7/87	550	0.30	-	210.00
9/15/87	580	0.40	-	110.00
9/30/87	480	0.40	-	110.00
10/13/87	590	0.55	-	52.00
10/27/87	520	0.70	-	40.00
6/26/90	610	1.60	9	15.00
7/10/90	580	1.05	12	29.00
7/25/90	560	0.90	18	31.00
8/8/90	590	0.60	26	49.00
8/23/90	570	0.60	34	64.00
9/7/90	590	0.80	90	62.00
9/19/90	580	0.70	90	11.00
10/2/90	560	0.90	62	50.00
10/17/90	570	0.65	150	80.00
10/30/90	650	0.90	74	8.00
5/21/91	480	1.10	-	10.00
6/5/91	580	0.90	13	28.00
6/18/91	490	0.85	11	24.00
7/1/91	510	0.40	56	120.00
12/20/91	499	1.05	13	15.00
5/12/92	630	0.30	81	99.00
5/27/92	640	0.60	48	69.00
6/9/92	610	0.55	38	89.00
8/5/92	450	0.25	26	210.00
2/1/93	484	*	7	5.30
2/15/94	536	*	3	5.20

MIN	450	0.25	3	5.20
MAX	650	1.60	150	210.00
AVG.	553	0.69	43	62.60

* Not applicable, ice cover

Table F-1 (Cont.). Water quality monitoring results from samples collected at site W-I135.4B

DATE	CHLOROPHYLL a (MG/M3)	CHLOROPHYLL b (MG/M3)	CHLOROPHYLL c (MG/M3)	PHEOPHYTIN a (MG/M3)
5/27/87	450.0	<21	87.0	62.0
6/9/87	320.0	7.0	62.0	100.0
6/23/87	340.0	<4	48.0	62.0
7/7/87	660.0	72.0	70.0	130.0
9/15/87	290.0	<2	67.0	220.0
9/30/87	250.0	16.0	38.0	110.0
10/13/87	130.0	9.0	27.0	94.0
10/27/87	210.0	15.0	23.0	29.0
6/26/90	17.0	3.0	<2	<2
7/10/90	20.0	8.0	7.0	8.0
7/25/90	48.0	<2	5.0	27.0
8/8/90	32.0	<2	<2	<2
8/23/90	84.0	7.0	2.0	34.0
9/7/90	8.0	5.0	<2	9.0
9/19/90	111.0	9.0	2.0	27.0
10/2/90	46.0	<2	<2	44.0
10/17/90	56.0	<2	5.0	42.0
10/30/90	16.0	<2	<2	25.0
5/21/91	50.0	5.0	3.0	9.0
6/5/91	28.0	3.0	3.0	42.0
6/18/91	36.0	<2	3.0	2.0
7/1/91	160.0	10.0	5.0	2.0
12/20/91	120.0	3.8	21	32.0
5/12/92	40.0	3.0	7.0	72.0
5/27/92	4.0	4.0	3.0	80.0
6/9/92	192.0	3.0	16.0	21.0
8/5/92	240.0	5.0	23.0	12.0
2/1/93	20.7	17.2	11.9	80.3
2/15/94	13.2	<1.3	4.6	<2.7

MIN	4.0	<1.3	<2	<2
MAX	660.0	72.0	87.0	220.0
AVG.	137.7	-	-	-

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HYDROLOGY AND HYDRAULICS

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17D)

RICE LAKE STATE FISH AND WILDLIFE AREA
HABITAT REHABILITATION AND ENHANCEMENT

LA GRANGE POOL, ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

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HYDROLOGY AND HYDRAULICS

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APPENDIX G
HYDROLOGY AND HYDRAULICS

INTRODUCTION AND LOCATION

The project site is along to the Illinois River adjacent to the west bank between River Miles (RM) 132 and 138. At present, high ground or low levees isolate the project site from the Illinois River.

The site is upstream of the La Grange Lock and Dam (RM 80.1) where the flat pool elevation is 429 feet (1929 datum). All elevations used in this appendix are National Geodetic Vertical Datum (NGVD). The nearest operating gages are at Havana (RM 119.6), Copperas Creek (RM 136.9), and Kingston Mines (RM 145.4). River miles are taken from Reference 1. The drainage area of the Illinois River is 18,299 square miles at the Havana gage and 15,819 square miles at Kingston Mines (Reference 2).

CLIMATE

The National Weather Service at Havana, Illinois, recorded the data used for the project site. The data shown in the table was from the period 1901 through 1966. The gage identification number is 3930.

The average annual daily minimum temperature was 42 degrees, while the average annual daily maximum temperature was 64 degrees Fahrenheit. However, the temperatures in central Illinois can fluctuate over an extreme range. Average monthly temperatures range from a maximum of 89.2 degrees Fahrenheit in July to a minimum of 17.5 degrees Fahrenheit in January.

The precipitation is moderate, with an average annual value of 34.0 inches. The average annual snowfall is 21.4 inches. As can be seen from Table G-1, June has the highest average rainfall. Winters are normally the driest parts of the year.

TABLE G-1

Normal and Extremes of Monthly Precipitation

	---------Precipitation---------					-------Snow------		
	Avg.	**Maximum**		**Minimum**		**Avg.**	**Maximum**	
Month	**In.**	**In.**	**Yr.**	**In.**	**Yr.**	**In.**	**In.**	**Yr.**
Jan.	1.83	9.74	1916	.02	1919	5.58	22.9	1918
Feb.	1.49	4.35	1908	.05	1947	4.70	14.2	1908
Mar.	2.78	7.30	1901	.26	1910	4.43	23.5	1960
Apr.	3.62	7.68	1957	.89	1901	.68	11.5	1920
May.	3.76	9.82	1935	.39	1934	.00		
Jun.	4.05	9.68	1947	.40	1933	.00		
Jul.	3.50	10.95	1937	.25	1916	.00		
Aug.	3.12	7.16	1965	.52	1935	.00		
Sep.	3.61	13.14	1911	.07	1940	.00		
Oct.	2.42	12.22	1941	.12	1964	.13	3.05	1925
Nov.	2.14	6.78	1942	.04	1914	1.07	9.70	1926
Dec.	1.68	5.82	1949	.26	1919	4.71	15.2	1942

ILLINOIS RIVER

FLOOD CONDITIONS

Although the project is not designed to operate during floods, it is useful to know flood conditions at the site. Plate G-1 shows the flood profiles on the Illinois River in the vicinity of the project site. Profiles were taken from Reference 1.

STAGE HYDROGRAPHS AND STAGE DURATION

The stage hydrographs from 1960 through September 1996 appear on plates G-2 through G-14. These daily stages were recorded at the Copperas Creek gage; elevations are in feet NGVD.

Plate G-15 shows the stage-duration curve for the year round daily data from 1960 through 1994.

CULVERT SIZE FROM RIVER TO PUMP STATION

During the fall season, water will be pumped into the lakes. Pipes were sized to bring water from the Illinois River to the pump station.

Plate G-16 lists the lowest yearly recorded stage at Copperas Creek (1960 through 1996). Low stages often occurred during months when the pumps would be operating. The mean of the low water elevations for the 37 years is 430.4 feet NGVD. The standard deviation is 0.8 foot. Elevation 430 feet NGVD was selected as the design inlet elevation. During the 37-year period, stages at Copperas Creek dropped below elevation 430 feet NGVD 13 times (34 days). The durations lasted from 1 day (4 times) to 5 days (3 times). The lowest observed stage was 429.2 feet NGVD.

Two 5.5-foot-diameter culverts were selected to bring water to the pump station. The total pump capacity is 100,000 gallons per minute. The design criteria used to size the pipes are listed in Table G-2. Since the minimum recorded stage on the Illinois River is 429.2 feet NGVD, the invert elevation at the inlet should be 423.5 feet NGVD to ensure the pipe flows full under all conditions. A rating curve for the two 5.5-foot-diameter culverts appears on plate G-17.

TABLE G-2

Design Parameters for Culvert

Parameter	Value
Maximum Discharge	222.8 cubic feet per second
Pipe Length	375 ft. used 400 feet
Water Level at Inlet	430 feet NGVD
Water Level at Pump Station	428 feet NGVD
Pipe Material	corrugated metal pipe (n=0.024)
Obstructions	no gates, valves, or bends
Type of Headwall	assume 90 degrees
Entrance Loss	used 0.5
Maximum Diameter	about 5 feet

ALTERNATIVES THAT WILL RAISE THE INTERIOR WATER LEVEL BEFORE THE ILLINOIS RIVER FLOWS OVER LEVEE CREST

Damage to the Hate Levee and the proposed levee system can be reduced by raising the interior water level before the Illinois River flows over the crest of the levee. One alternative for flooding the lakes is to create an overland flow corridor that would act like a spillway. The primary alternative for flooding the lakes is a spillway section in the Hate Levee. This section examines these two alternatives.

OVERLAND FLOW CORRIDOR

The corridor would be a gap in the proposed levee system. It would start at the southeast end of the Hate Levee and extend upstream along the northwest bank of the Illinois River. Several flow corridor widths were examined; however, the overland flow corridor is not an acceptable substitute for a spillway. The discharges are too small to raise the interior water level in a timely manner.

The overland corridor was analyzed by determining an inflow hydrograph and then routing this hydrograph into the interior lakes. To be considered effective, the interior water level had to be within a foot of the levee crest when it was overtopped by the Illinois River.

Discharges Through the Overland Flow Corridor

Discharges through the corridor were calculated every 6 hours for a total period of 48 hours. The discharge is mainly a function of the corridor width and the elevation on the Illinois River since the level in the lake never rises high enough to retard the flow. The elevation of the Illinois River at the project site was assumed to increase linearly from elevation 440 feet to elevation 442 feet in 2 days (48 hours). The maximum observed stage increase for the Illinois River to rise from elevation 440 to 442 was 1.5 feet for 1 day and 2.0 feet for 2 days (see page 52 of reference 3). The stage was assumed to rise steadily over 2 days since this would produce less inflow into the study area than if it increased 1.5 feet the first day and 0.5 feet the second day. The assumptions from reference 3 were verified by examining stage data for Copperas Creek for the period 1990 through 1995.

Each point on the stage hydrograph was converted to a discharge value using a rating curve for the flow corridor. An HEC-RAS model was used to produce the rating curve. This water surface profile model was composed of 10 cross sections and modeled the flow corridor from the edge of Goose lake up to the bank of the Illinois River. The total length of the model was 2,176 feet. The width of the cross section depended upon the corridor width.

An "n-value" of 0.1 was used for the cross sections to simulate flow though dense woods. The water surface profiles were started at normal depth using the slope between the first two cross sections. A second sensitivity analysis that started at elevation 439 feet produced essentially the same answers. The cross section with the highest ground elevations was at the bank of the river. Ground elevations varied between elevation 440 feet and 442 feet. Three corridor widths were modeled: 2,500 feet, 3,500 feet, and 4,500 feet. The rating curves for the three corridors appear on plate G-18.

Maximum Interior Water Level Using the Overland Flow Corridor

The final water level was computed with an HEC-1 model using a modified Pulls routing. Computations started with an interior water elevation of 434 feet. The discharge hydrograph was entered at 6-hour intervals. However, computations were made at 1-hour intervals. The elevation-area data was taken from reference 3 (Table 4-1). The areas (and volumes) used in the model appear in Table G-3.

TABLE G-3

Elevation-Area Data Used in Overland Flow Corridor Model

Elevation (feet)	Surface Area (acres)	Storage Volume (acre-feet)
434	1220	0
434.5	1450	667
435	1650	1443
435.5	1790	2302
436	1920	3230
437	2070	5225
438	2195	7358
439	2326	9618
440	2475	12018
441	2533	14522
442	2594	17086

Several existing or proposed features will separate the combined area of Goose Lake, Big Lake, and Lower Slim Lake from the combined areas around Rice Lake and the Duck Island Gravel Pit. These features include high ground, an existing spillway, and a proposed spillway. When the water level in Big Lake exceeds elevation 439 feet, it will start entering Rice Lake and the gravel pit. Since the overland flow corridor routings produced water levels below elevation 439 feet, the areas of Rice Lake and the gravel pit were not included in this model. A few of the Big Lake management units were inadvertently omitted. However, since the total area of every one of the management units is less than 10 percent of the area of Big, Goose, and Lower Slim Lakes the runs were not revised. Adding this area would not have changed the results significantly and the conclusions would not have changed at all.

The maximum computed interior water levels at the end of 48 hours have been rounded to the nearest foot and are listed in Table G-4. This is the computed water level for the combined areas of Big, Goose, and Lower Slim Lakes. At the end of 48 hours, the water level in the Illinois River is at 442 feet. The target interior lake level was elevation 441 feet. None of the overland flow corridors met the design criteria.

TABLE G-4

Interior Lake Levels with Overland Flow Corridor

Corridor Width (feet)	Interior Lake Elevation (feet)
2,500	436
3,500	437
4,500	438

HATE LEVEE SPILLWAY SECTION

The following section summarizes work to verify the proposed spillway section in the Hate Levee. The section is 2,500 feet long with a crest at elevation 440 feet NGVD. The approach was similar to the overland flow corridor analysis. An inflow hydrograph was developed and routing into the interior lakes.

Discharges Through the Spillway Section

The spillway was evaluated using the same stage hydrograph used in the flow corridor model. The stage was assumed to rise steadily from elevation 440 to elevation 442 in 48 hours.

The discharge hydrograph used in this HEC-1 model was computed using the weir equation (Q=CLH^1.5). The weir coefficient (C) started at 2.8 and was increased to 3.0 above a depth of 1.5 feet. The coefficient was obtained from reference 4 (page 5-43). Similar coefficients were also found in reference 5 (2.7 for a head of 1 feet and 3.0 for a head of 2.0 feet. The weir length is 2,500 feet. The height (H) is the difference between the Illinois River water level and the weir crest (elevation 440 feet).

After a trial HEC-1 run, the discharge hydrograph was modified. During the last 14 hours of the HEC-1 routing, the water level of Big Lake exceeded elevation 440 feet and submerged the weir in the Hate Levee. A plot in Reference 4 (page 5-18) was used to estimate the reduction in discharge from the submerged condition. The plot related the ratio of the depths of water upstream and downstream of the weir to the ratio of the submerged discharge to the free discharge. The submerged discharge varied from 0.98 to 0.65 of the free discharge.

Maximum Interior Water Level with Spillway Section

The spillway HEC-1 model contained two routings, while the corridor HEC-1 model contained only one routing. The discharge hydrograph (from the Illinois River) was routed into unit 1 that simulated the combined areas of Goose Lake, Big Lake, Lower Slim Lake, and adjacent management units. The outflow from the unit 1 was then routed into unit 2 which simulated Rice Lake, the Duck Island Gravel Pit , and adjacent management units. Elevation-area data were obtained from Reference 3 (Table 4-1) and are repeated in Table G-5. The area of the gravel pit was added to Rice Lake since proposed construction of a levee with a crest of elevation 439 feet will separate it from Big Lake.

TABLE G-5

Elevation-Area Data Used in Spillway Model

Elevation (feet)	Unit 1 Area (acres)	Unit 1 Outflow (cfs)	Unit 2 Area (acres)
434	1226		
435	1675		1136
436	2006		1199
437	2227		1294
438	2440		1441
439	2620		1906
439.25		378	
439.5		1516	
439.75		2786	
440	2800	4290	2485
441	2873	10000	2590
442	2941	10000	2693

When the level of Big Lake exceeds 439, water will flow over a spillway in the narrows and enter Rice Lake. This flow was estimated for various levels in Big Lake using the weir equation and entered in the outflow table of unit 1. The values used appear in Table G-5. By the time the level in Big Lake reaches elevation 441, the weir between Big Lake and Rice lake is submerged. The discharge for elevations 441 and 442 was reduced to reflect reduced flow due to submergence. Otherwise, the weir coefficient varied from 2.6 to 2.8 and the weir length was 1,650 feet long.

The starting water level for Big Lake (unit 1) was set at elevation 434 feet while the starting water level for Rice Lake (unit 2) was set at 435 feet. The discharge hydrograph used a 1-hour time interval; the same interval was used for the computation interval. The maximum computed interior water levels at the end of 48 hours rounded to the nearest foot are listed in Table G-6.

TABLE G-6

Interior Lake Levels with Spillway Section

Location	Water Level (feet)
Illinois River	442
Big Lake (Unit 1)	442
Rice Lake (Unit 2)	441

INFLUENCE OF PROJECT UPON WATER SURFACE LEVELS IN THE ILLINOIS RIVER

The Rice Lake project is a combination of high ground and levee that increases the protection of Rice Lake, Big Lake, and Goose Lake from flooding by the Illinois River. The project lies west of the river and extends from river mile 132.2 upstream to river mile 136.7. The levee will be built with a design crest elevation of 442.0 feet from river mile 132.2 upstream to about river mile 134.9. The existing high ground from river mile 134.9 upstream to mile 136.7 is generally above elevation 442.0 feet. There are six places below elevation 442 feet that range from about 35 to 260 linear feet. These places will be built up to elevation 442.0 feet. Refer to plate 2 of the main report for an approximate alignment of the line of protection.

The maximum difference in water level between the with-project case and the without-project case is 0.06 foot, which was determined using HEC-2 and is summarized below.

DESCRIPTION OF HEC-2 MODELS

Models for the with- and without-project cases used identical cross sections. The channel n-value was calibrated to agree with published water surface profiles of the Illinois River at a discharge of 44,000 cubic feet per second. The actual analysis used a discharge of 34,000 cubic feet per second. This discharge was chosen because it would just overtop the upstream part of the proposed project. The model started at river mile 120 at an elevation of 440.1 feet and ended at river mile 148.26. The starting water surface level for a discharge of 34,000 cubic feet per second is in agreement with observed water levels and discharges at Kingston Miles (river mile 145.4).

The with-project case used Encroachment Table (ET) data to confine flow to the Illinois River. The ET data located the high ground or the center of the proposed levee. All of the 34,000 cubic feet per second discharge was confined to the river.

The without-project case used the same ET data to locate existing high ground (mile 134.9 to mile 136.7) but allowed expansion into the area around Goose Lake once the elevation of the high ground dropped below elevation 442 feet. The discharge for the with-project case was reduced to reflect flow leaving the river at the six low places. Cross sections and key station numbers are shown on plate G-19. Plate G-20 shows a crude plot of the ground elevation as a function of station number. The water leaving the Illinois River returns at mile 132.7.

The discharge leaving the river was computed using the weir equation ($Q = CLH^{1.5}$). Information on these areas is summarized in Table G-7. The broad-crested weir coefficient ($C = 2.7$) was determined using Hydraulic Design Criteria Sheet 711. If there were a large variation in weir height, the weir length was broken into parts to compute total discharge.

TABLE G-7

Information on Low Places in Existing High Ground

Identification Number	Station Number	Weir Length (feet)	Minimum Elevation (feet)	Height Below 442.0 (feet)	Estimated Flow (cfs)
1	12+70	70	441.6	0.4	48
2	17+05	90	441.8	0.2	21
3	20+70	260	441.25	0.75	352
4	37+30	35	441.75	0.25	12
5	42+00	170	441.0	1.0	265
6	54+65	110	439.0	3.0	675
				TOTAL	1373

SUMMARY OF RESULTS

The largest difference in water surface elevation between the with-project case and the without-project case for a discharge of about 34,000 cubic feet per second is 0.06 foot. A summary of the HEC-2 results by cross section appears in Table G-8. About 0.02 foot is due to differences in ET data and 0.04 foot is due to changes in discharge.

The discharge out of the channel into the low places is probably overland flow. However, the weir approach was to determine discharge because it was simple and because it would produce a larger difference between the with-project case and the without-project case profiles. The 0.06-foot difference appeared small enough to justify ending the analysis without further refinement. The low level of protection offered by the proposed project reinforced this decision. The proposed levee would produce insignificant changes in water level during a major flood event on the Illinois River.

TABLE G-8

Results of With-Project and Without-Project Cases

River Mile	Without Project (feet)	With-Project (feet)
131.70	441.41	441.41
132.20	441.46	441.46
132.70	441.49	441.49
133.20	441.53	441.54
133.70	441.57	441.60
134.20	441.63	441.66
134.60	441.70	441.74
135.20	441.79	441.83
135.70	441.92	441.98
136.20	442.04	442.10
136.70	442.15	442.21
137.20	442.21	442.27
137.70	442.29	442.35
138.20	442.38	442.44

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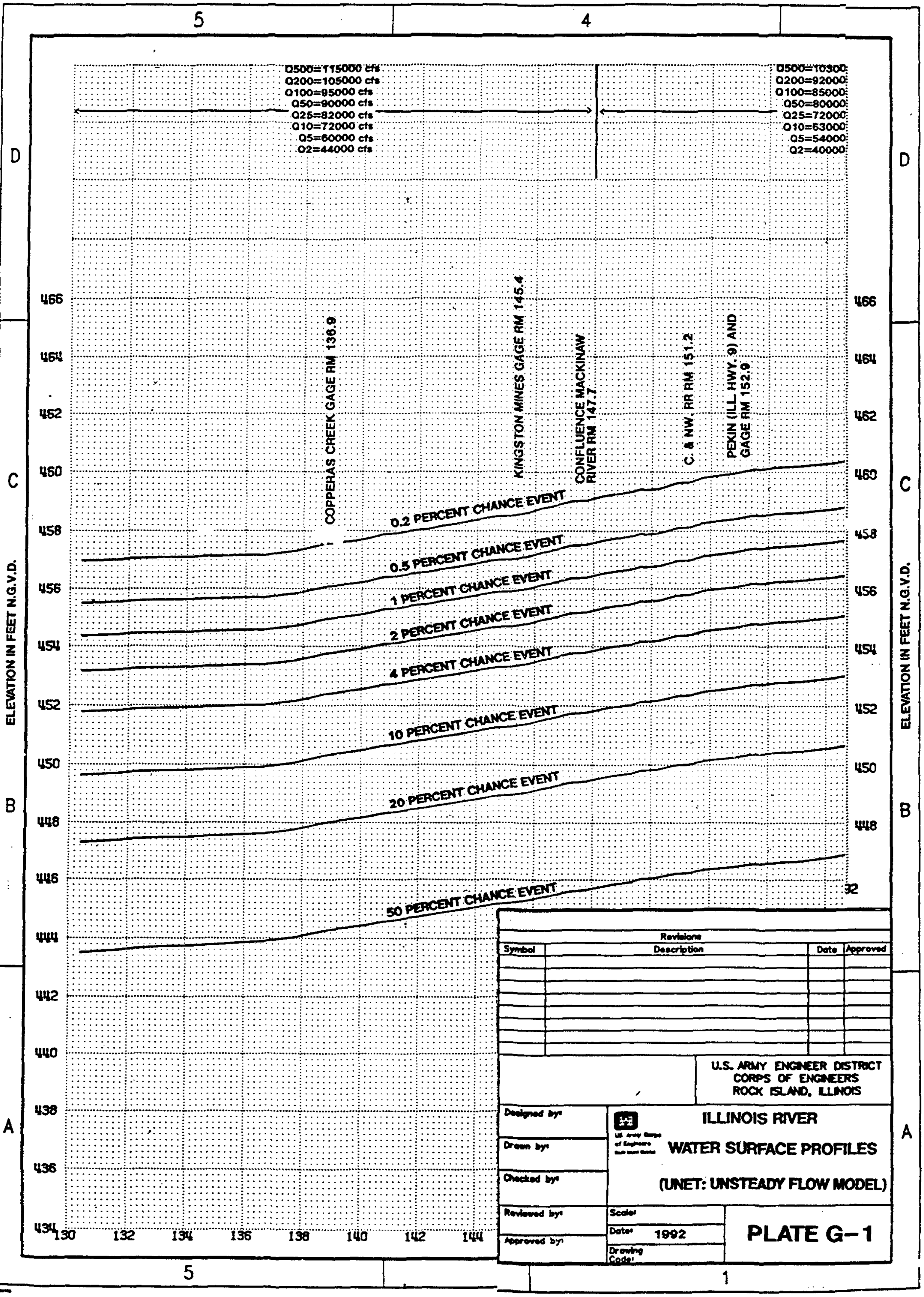
5. *Stability of Riprap and Discharge Characteristics, Overflow Embankments, Arkansas River, Arkansas,* U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Mississippi, June 1964.

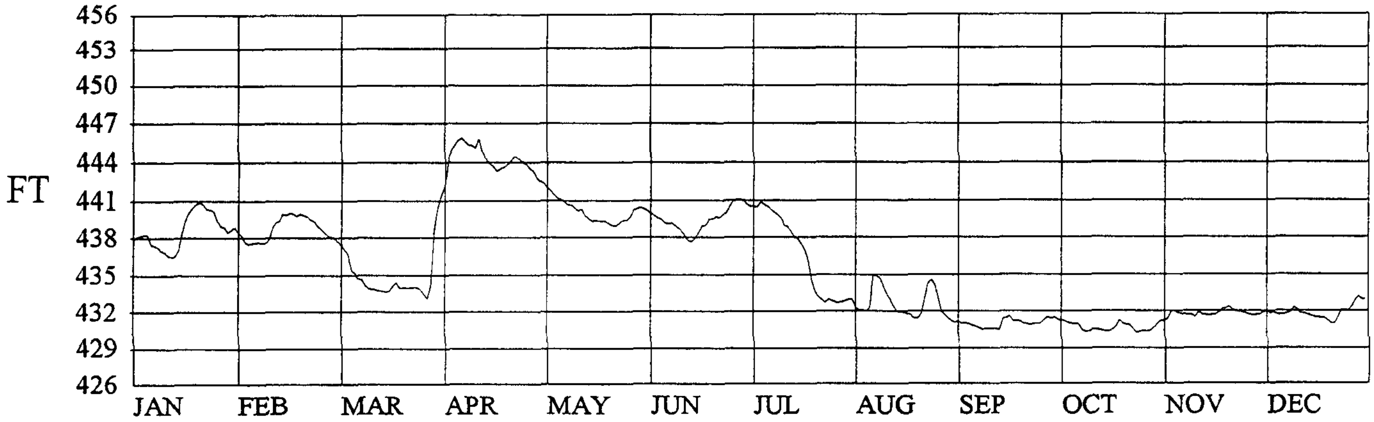


Revisions			
Symbol	Description	Date	Approved

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

Designed by:	ILLINOIS RIVER
Drawn by:	WATER SURFACE PROFILES
Checked by:	(UNET: UNSTEADY FLOW MODEL)
Reviewed by:	Scale:
Approved by:	Date: 1992
	Drawing Code:

PLATE G–1



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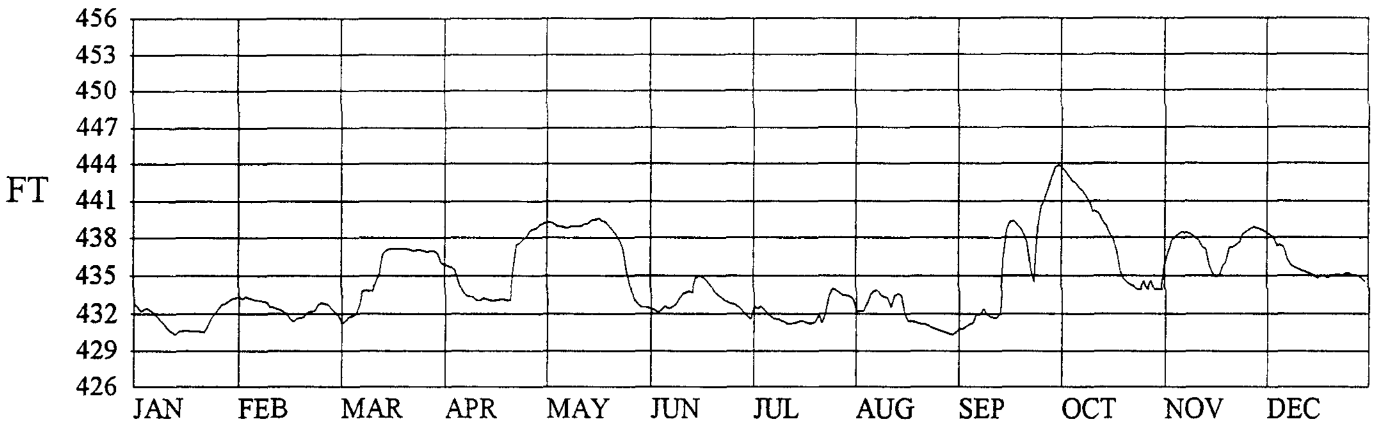

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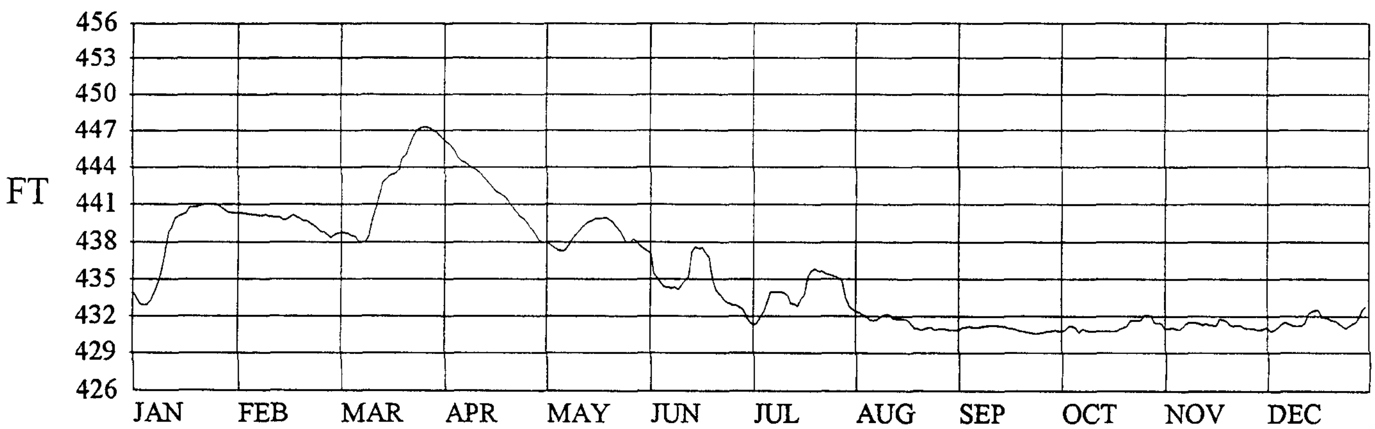

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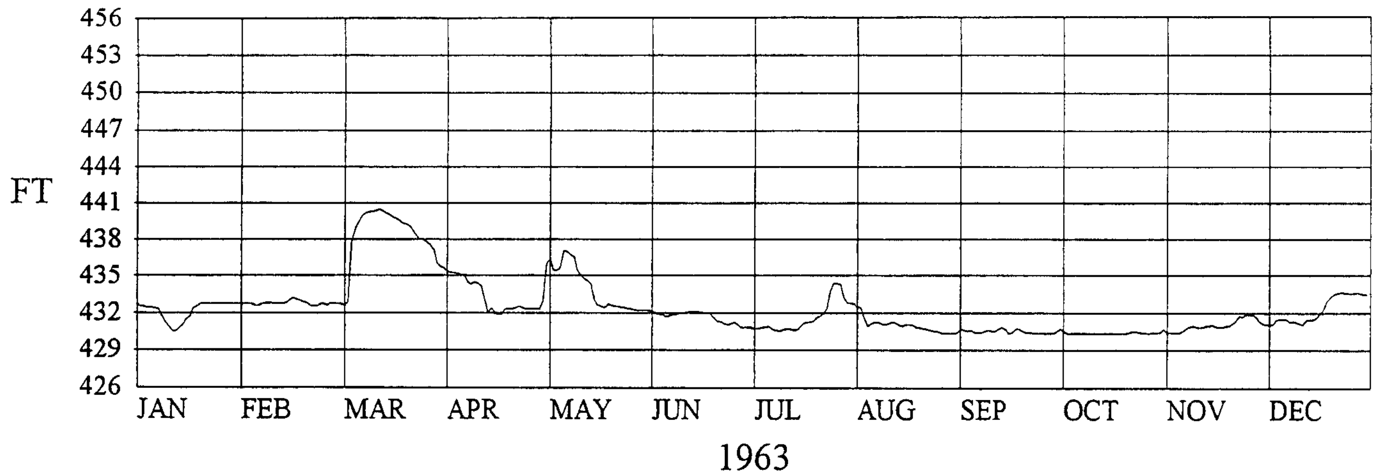
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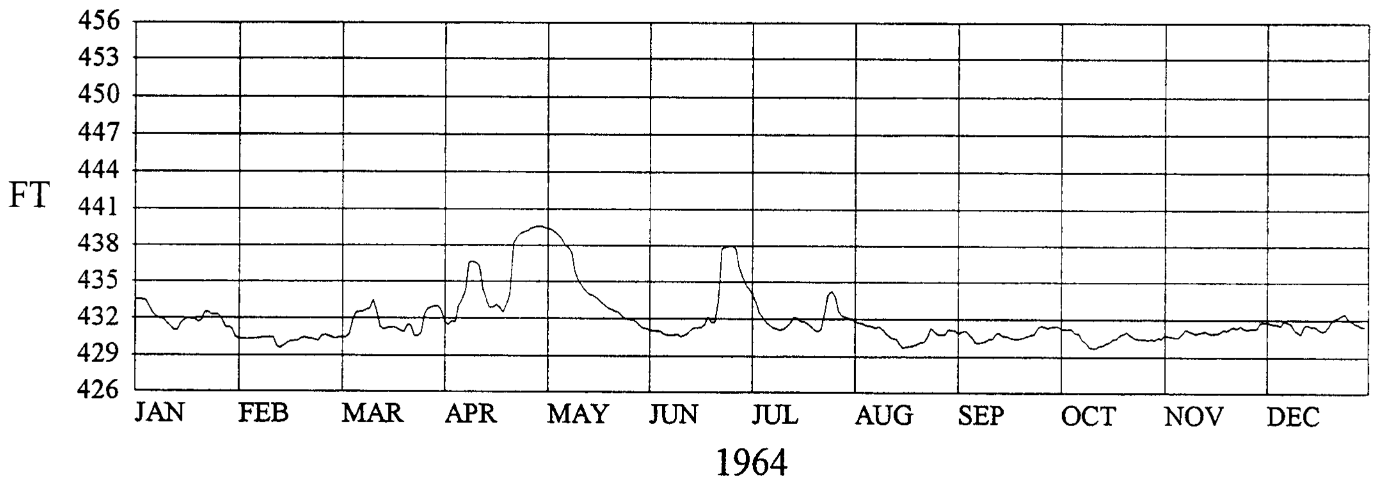
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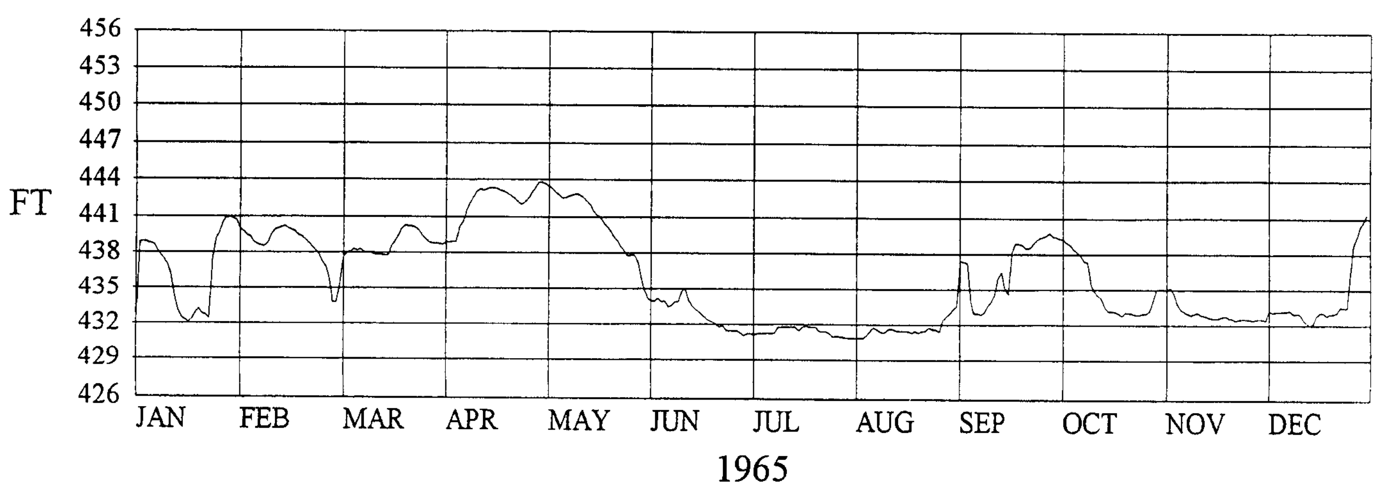
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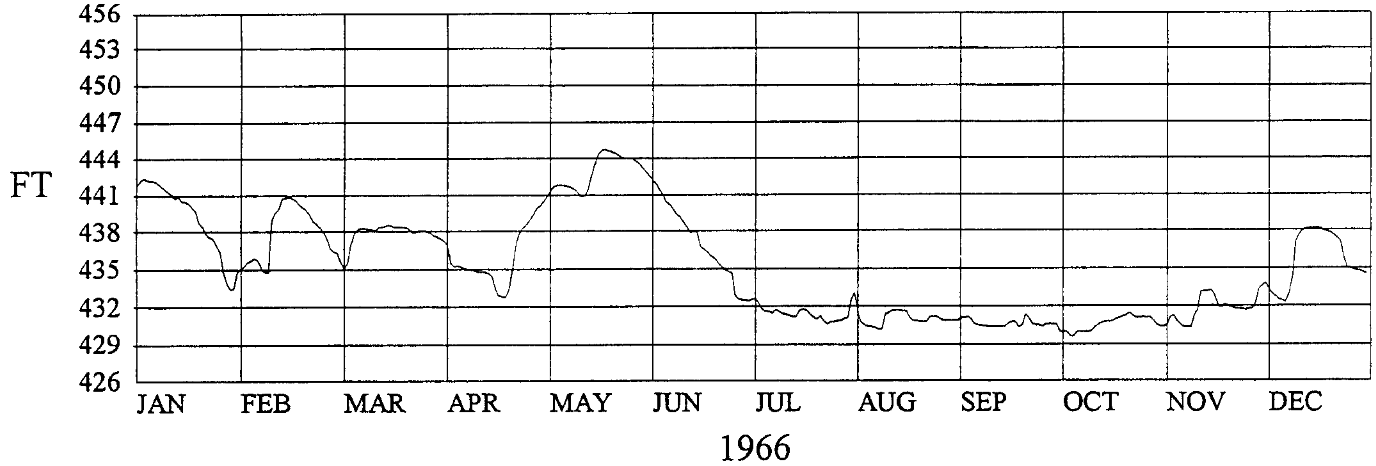
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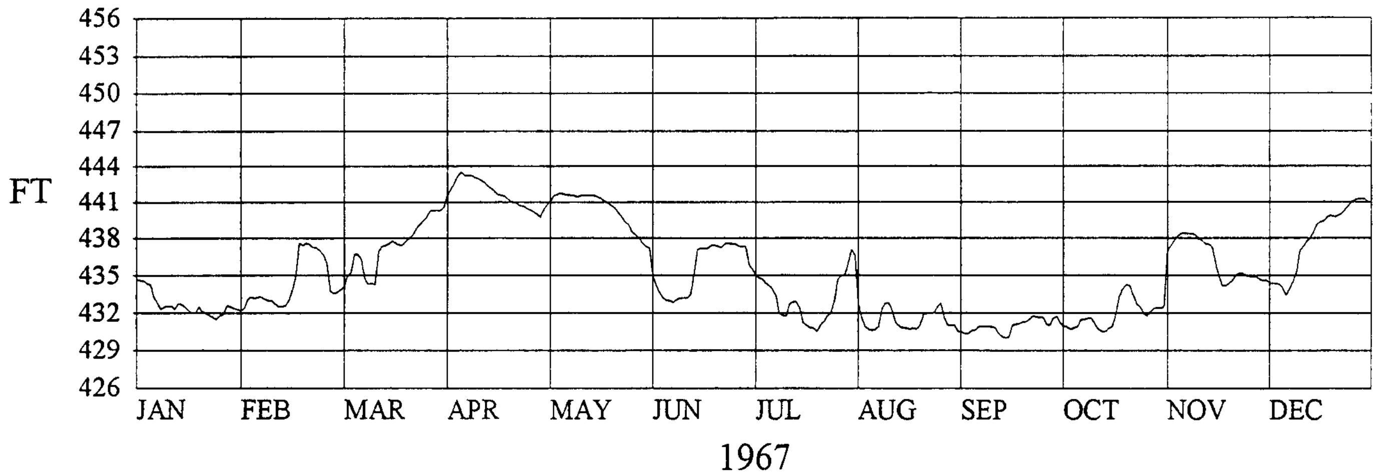
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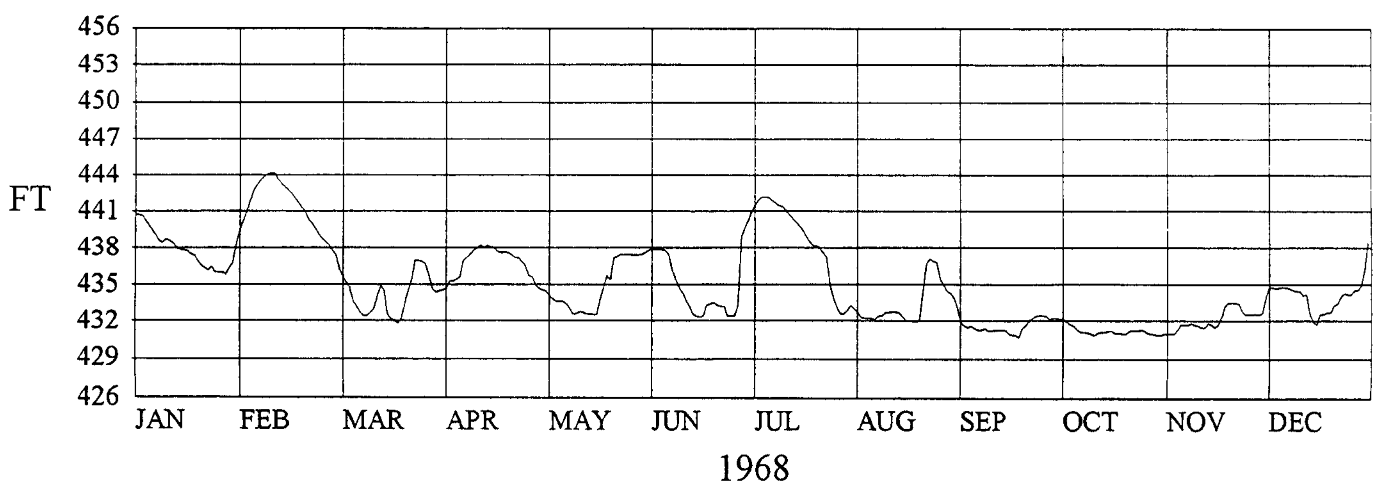
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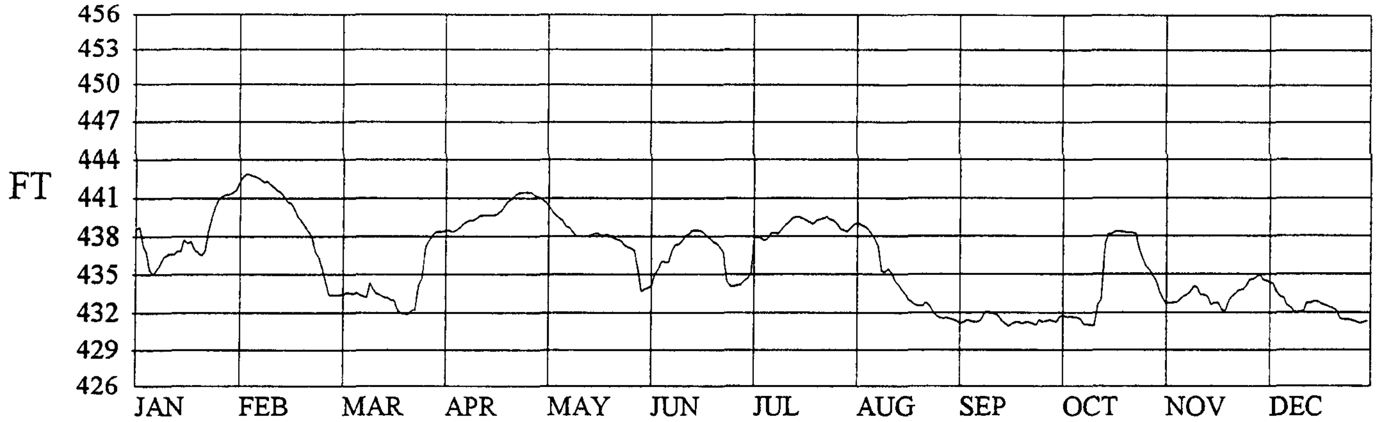

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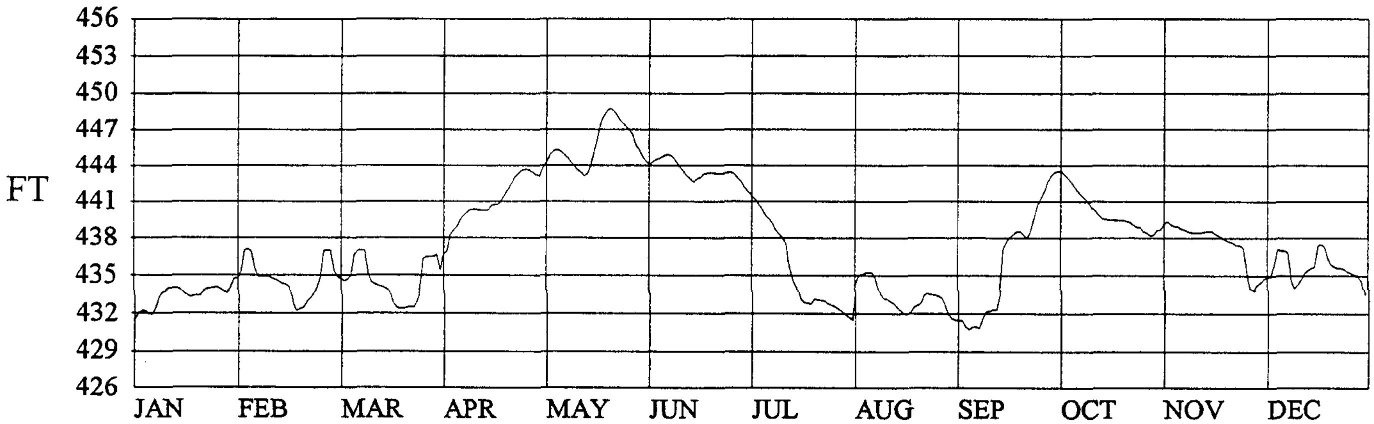

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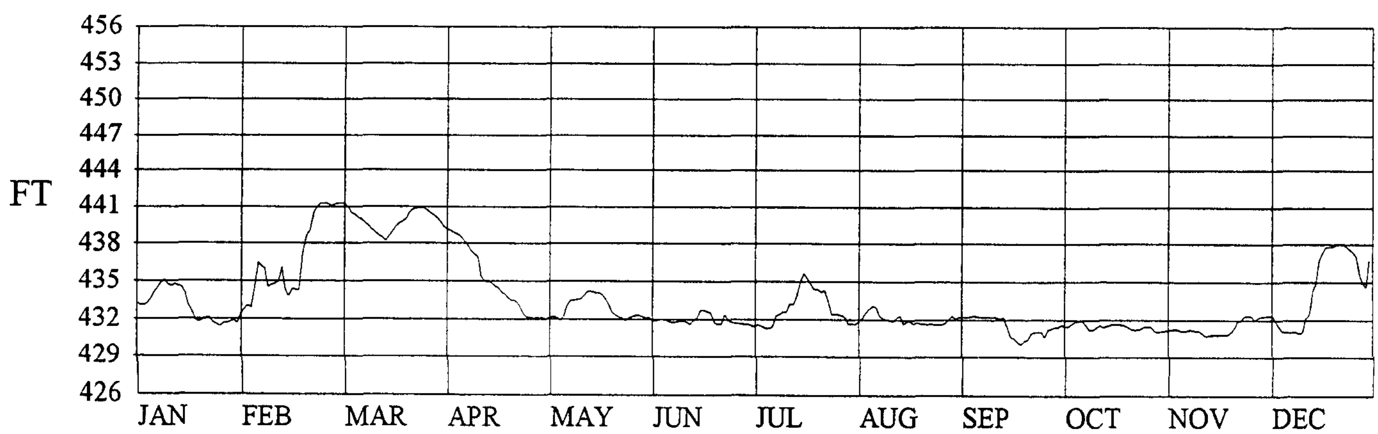

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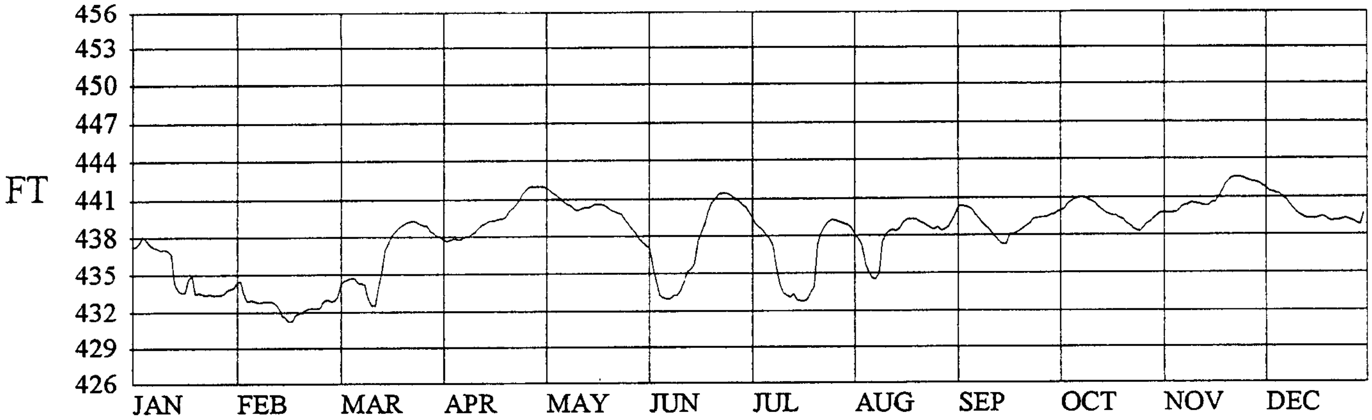

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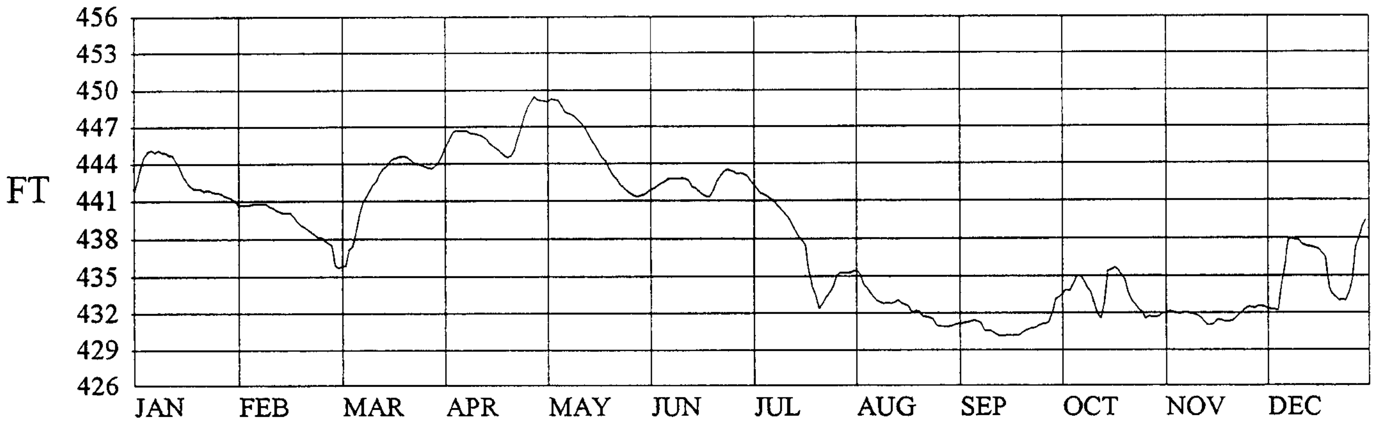

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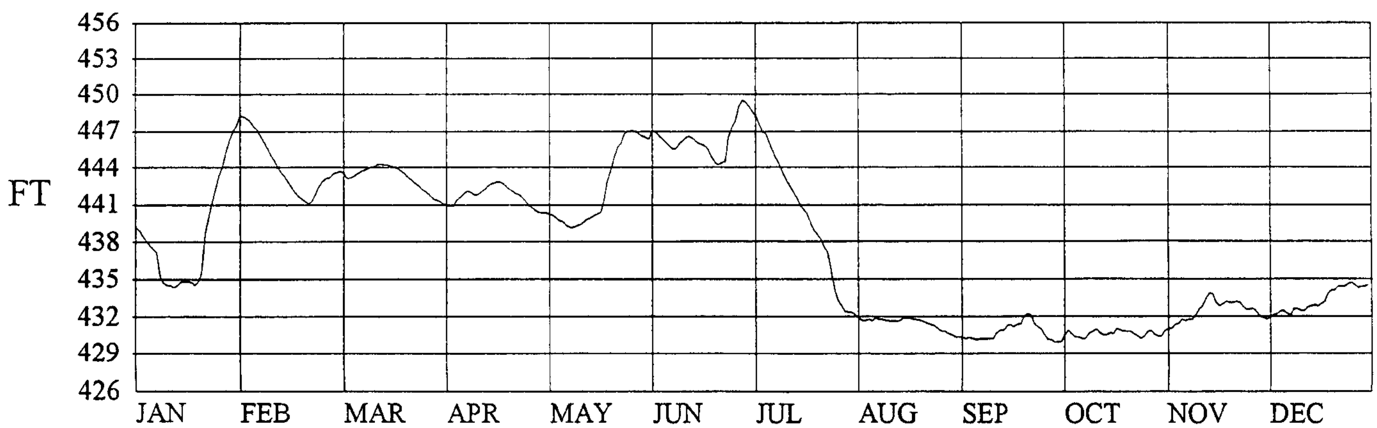

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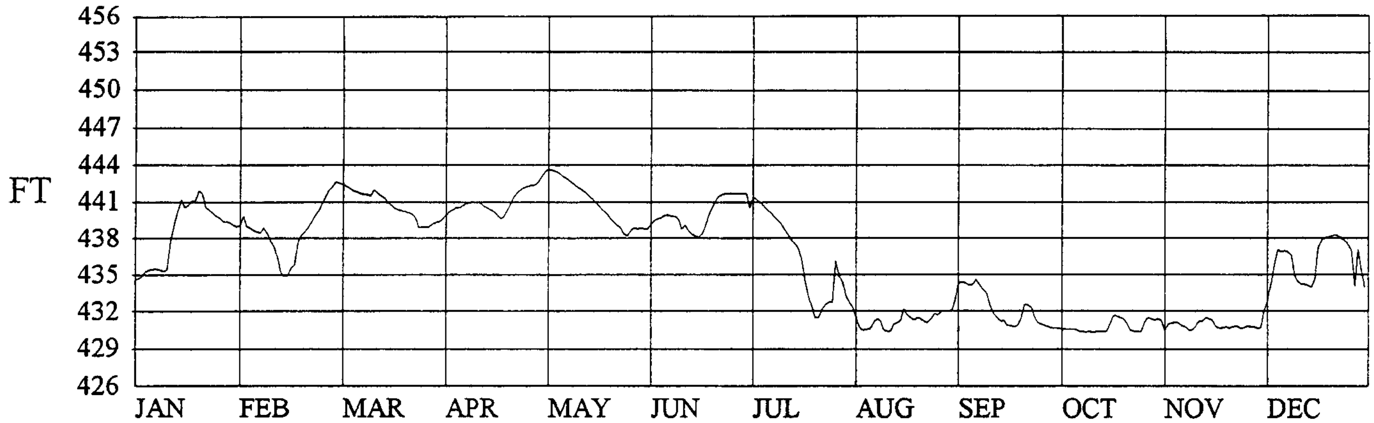

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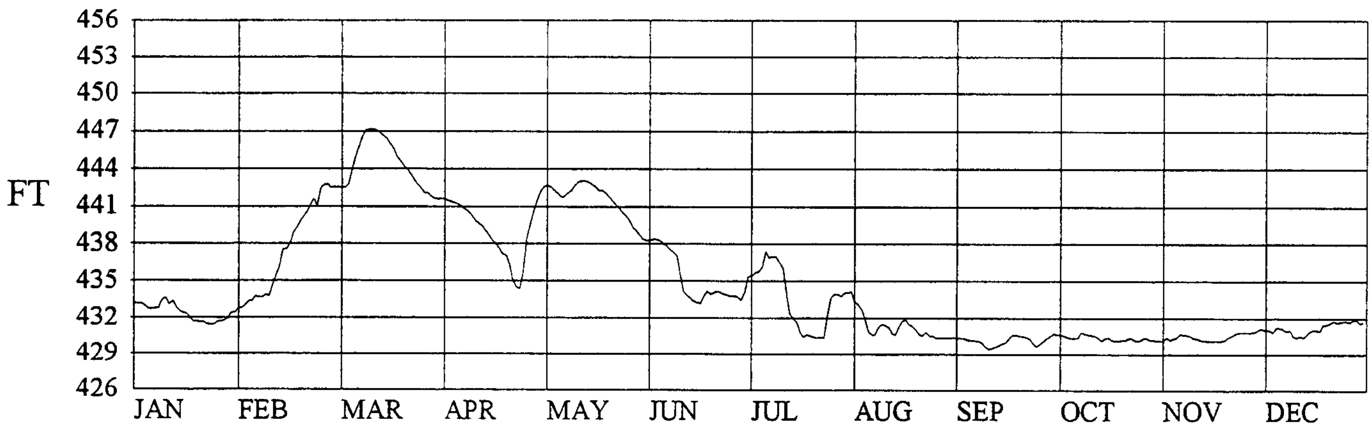

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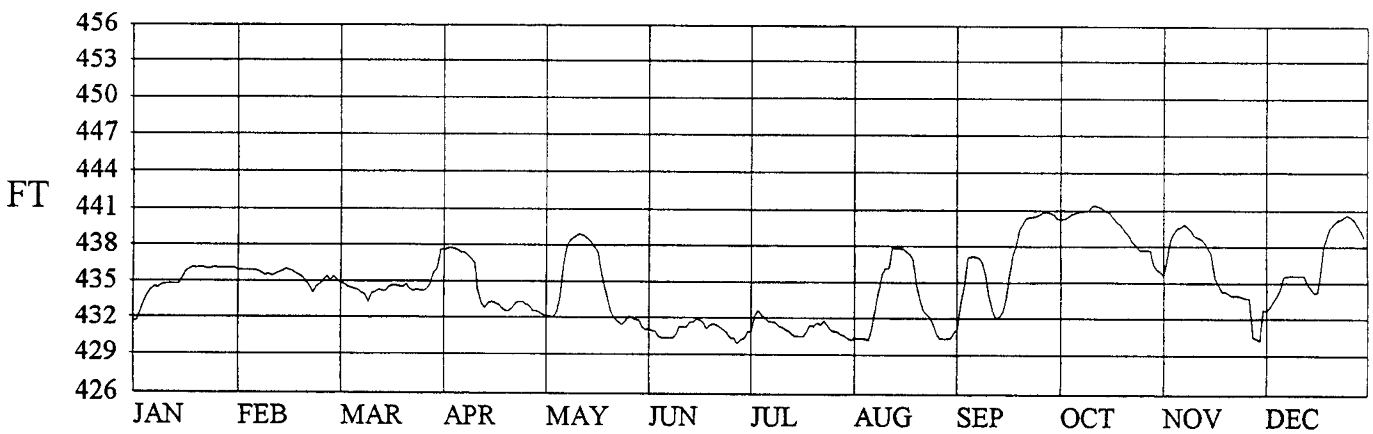

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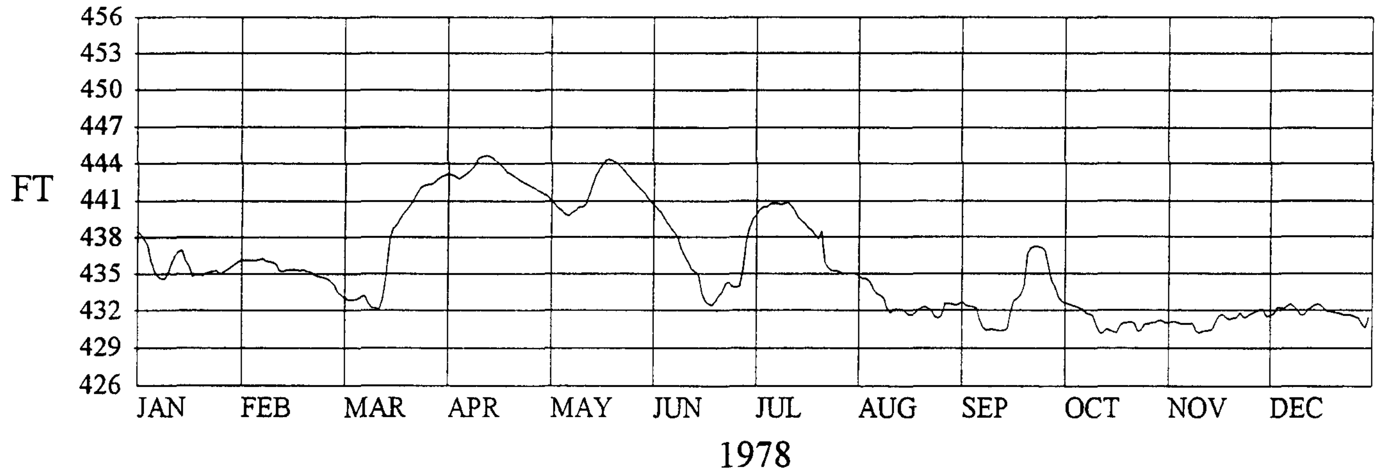
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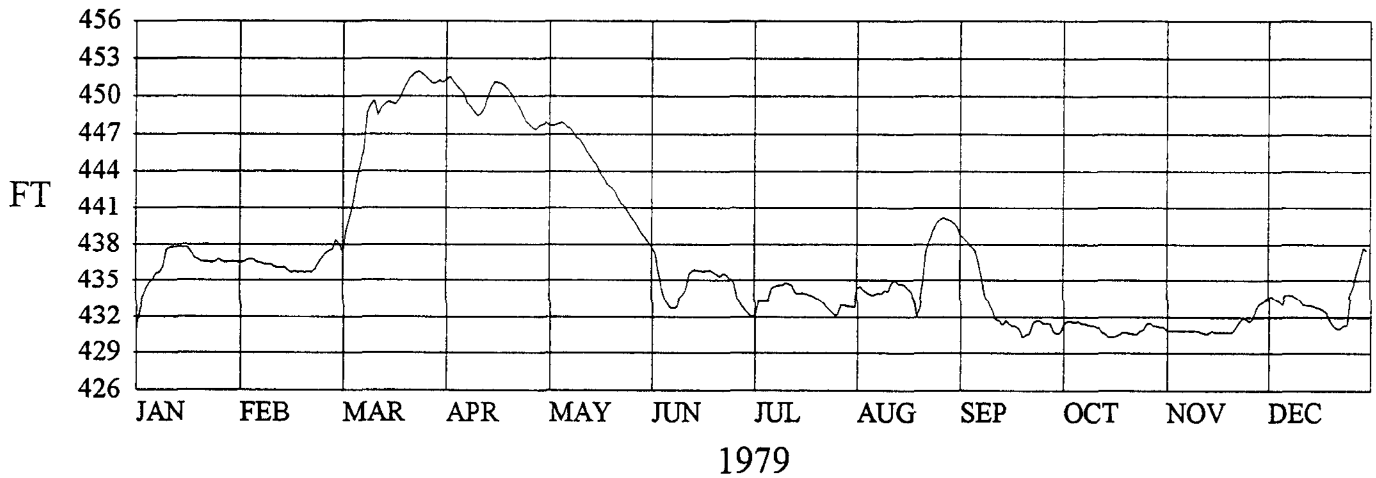
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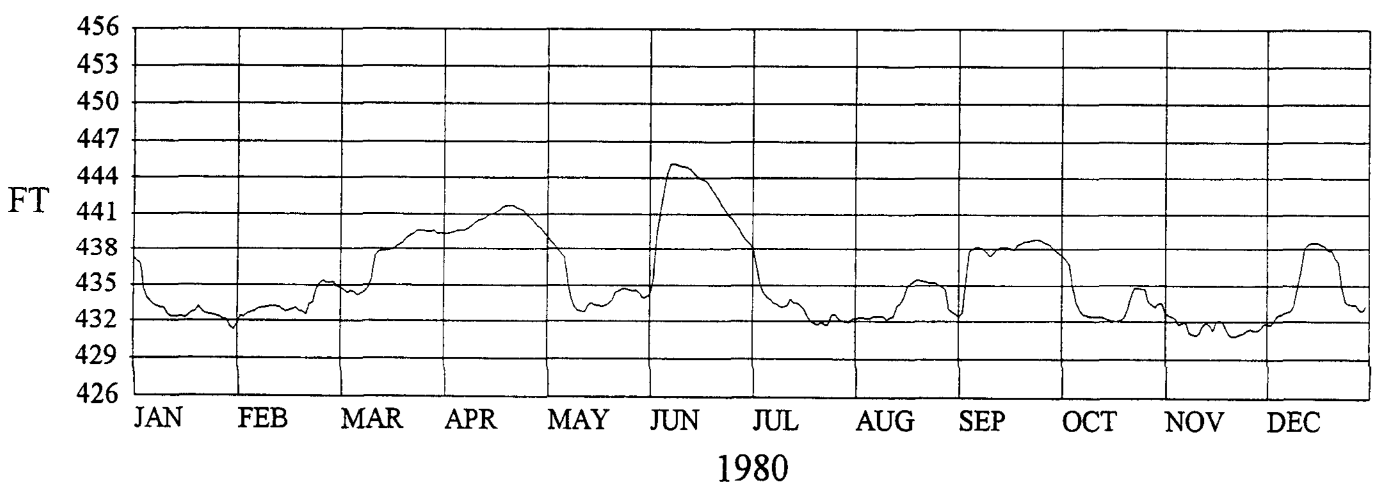
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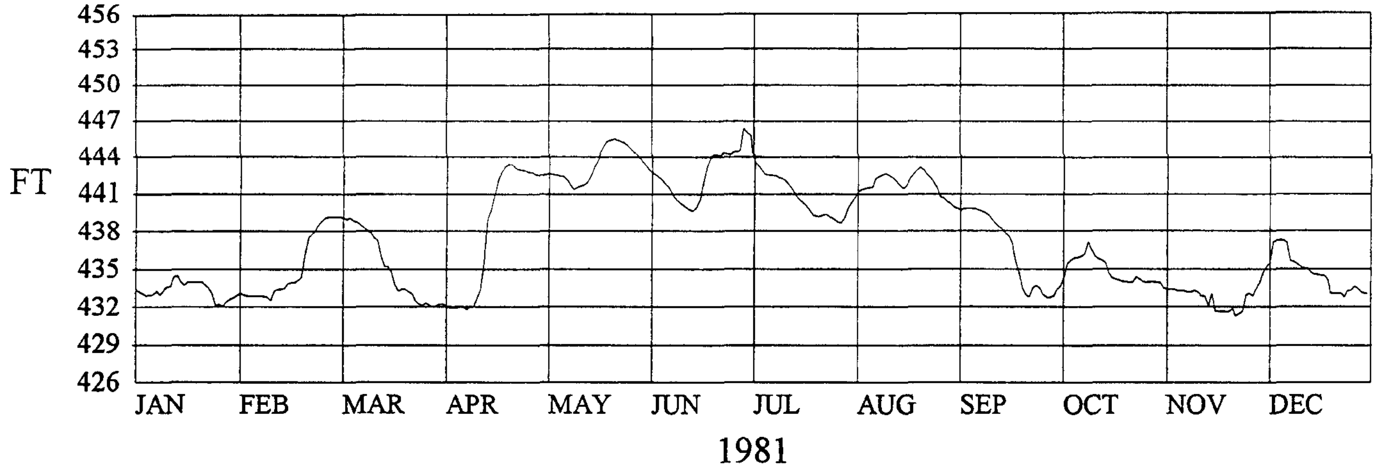
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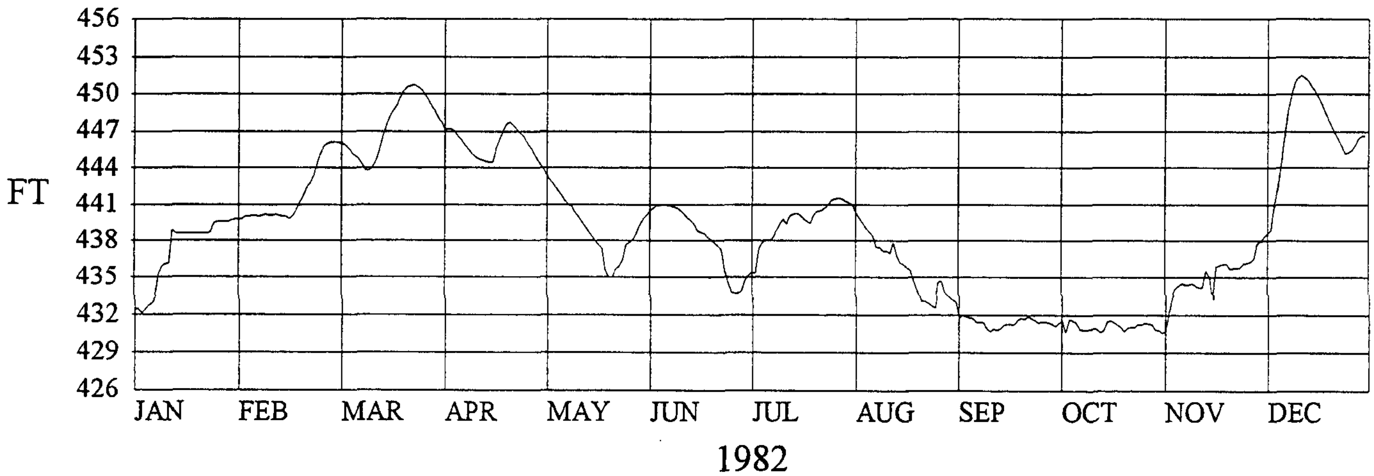
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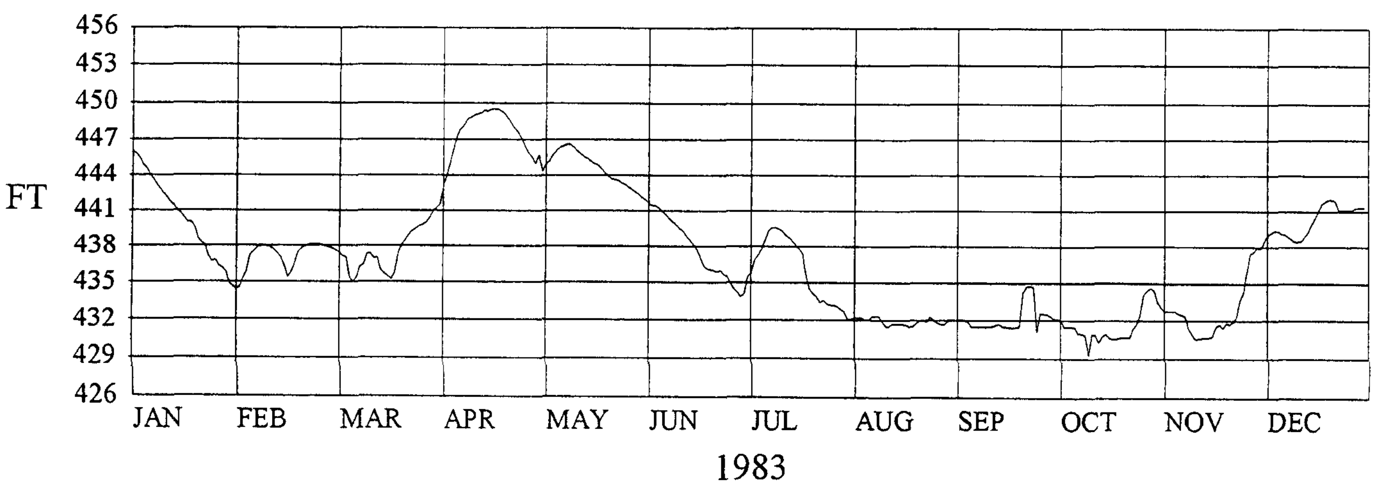
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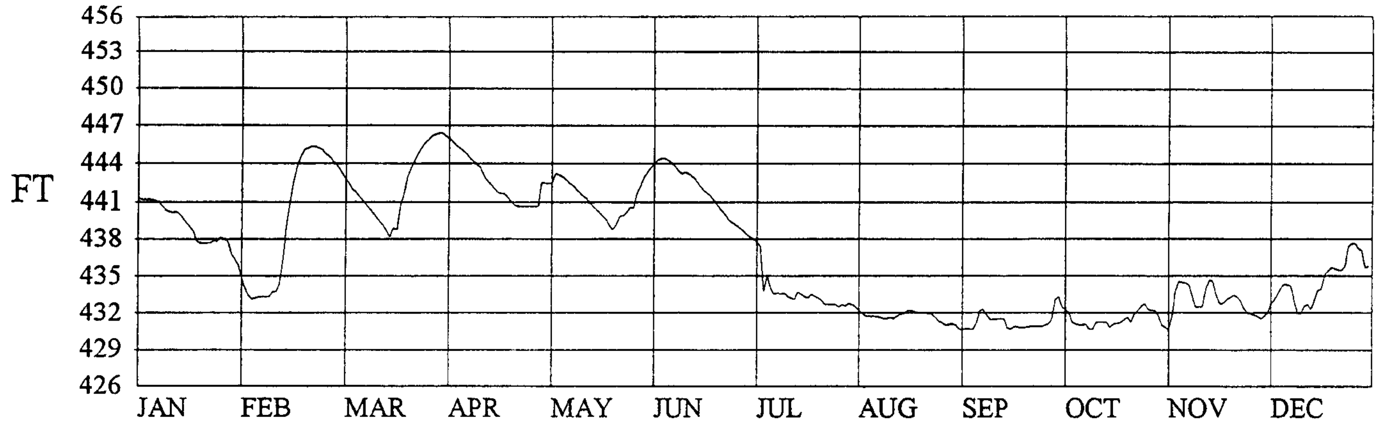

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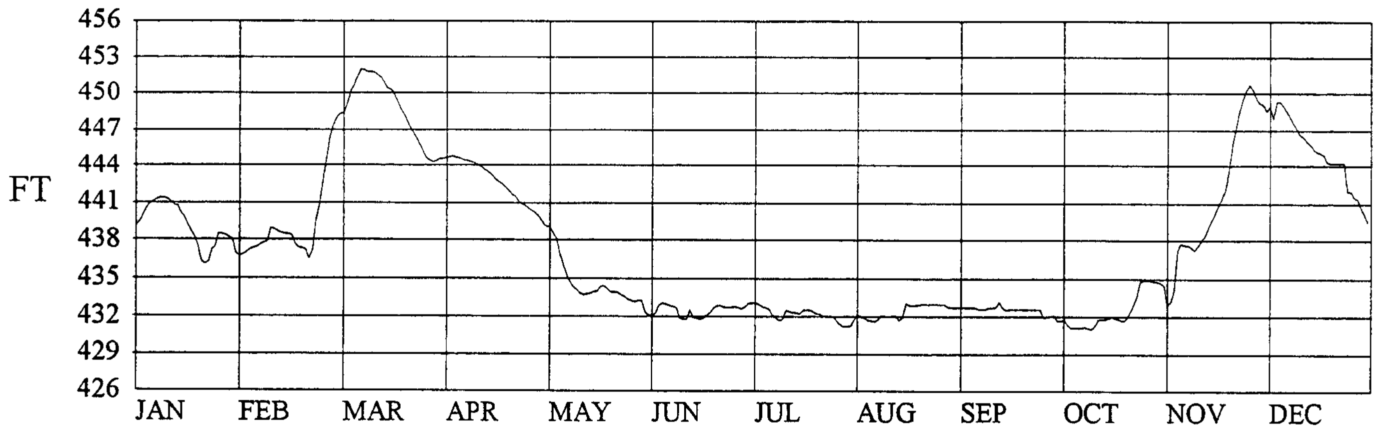

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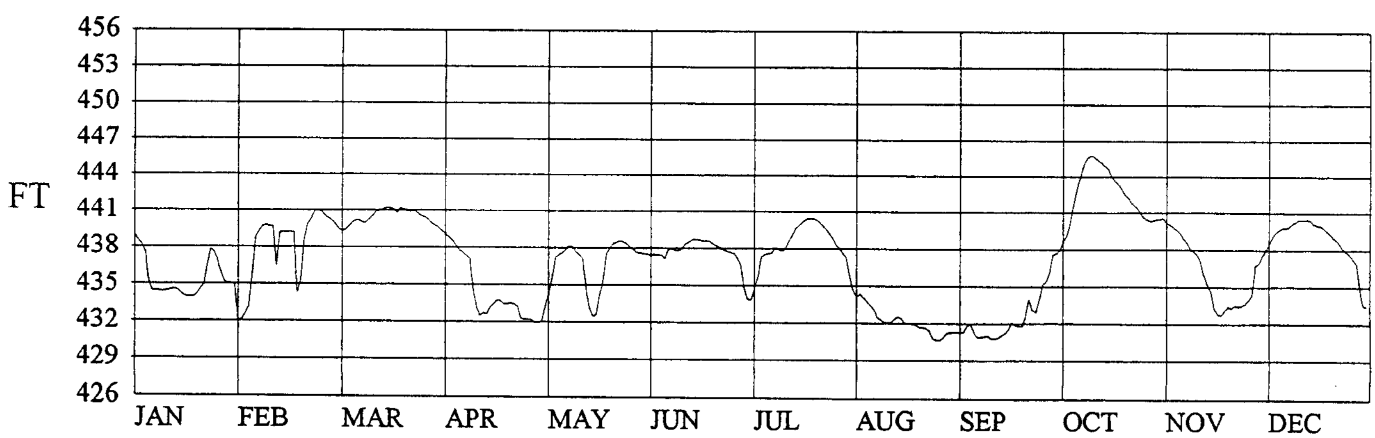

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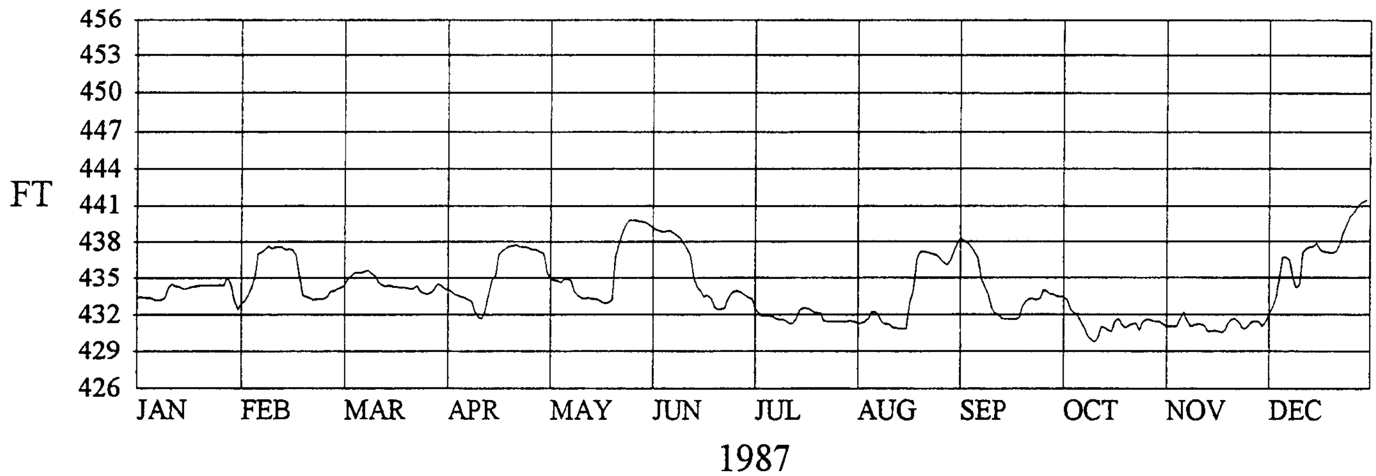
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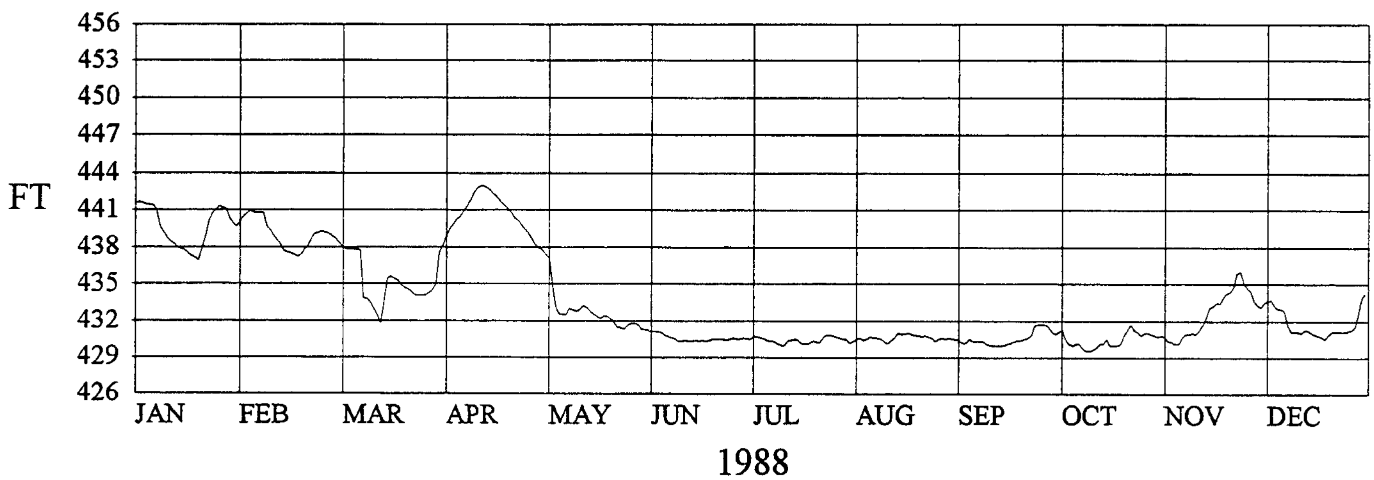
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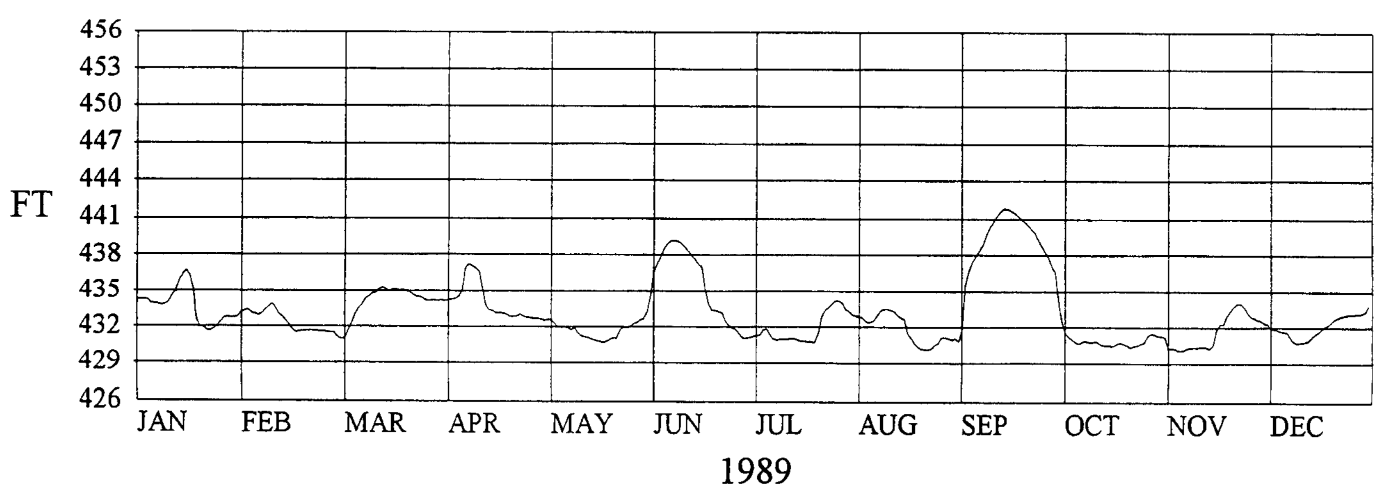
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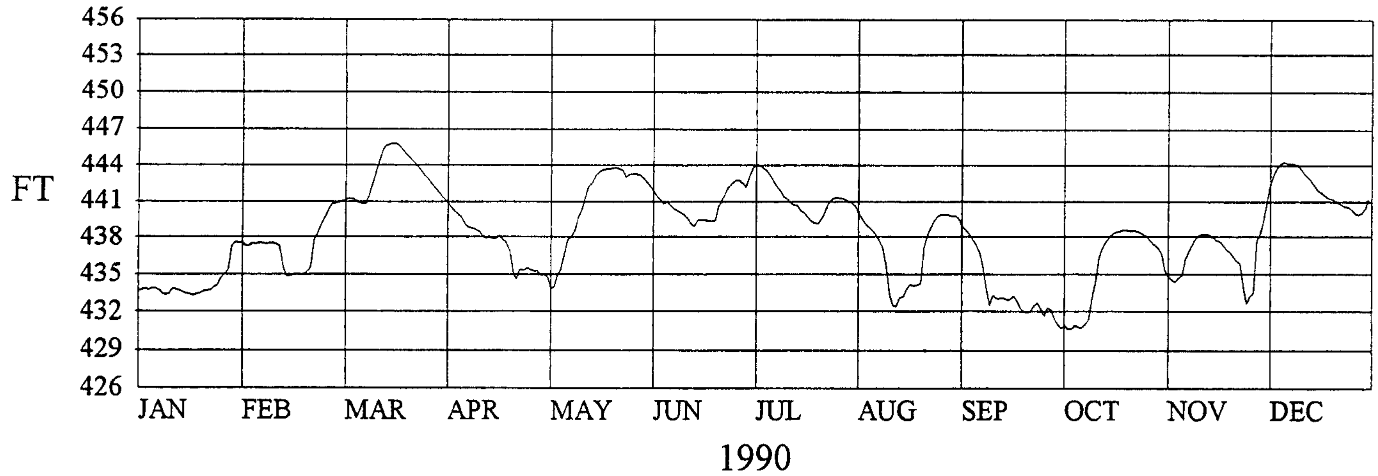
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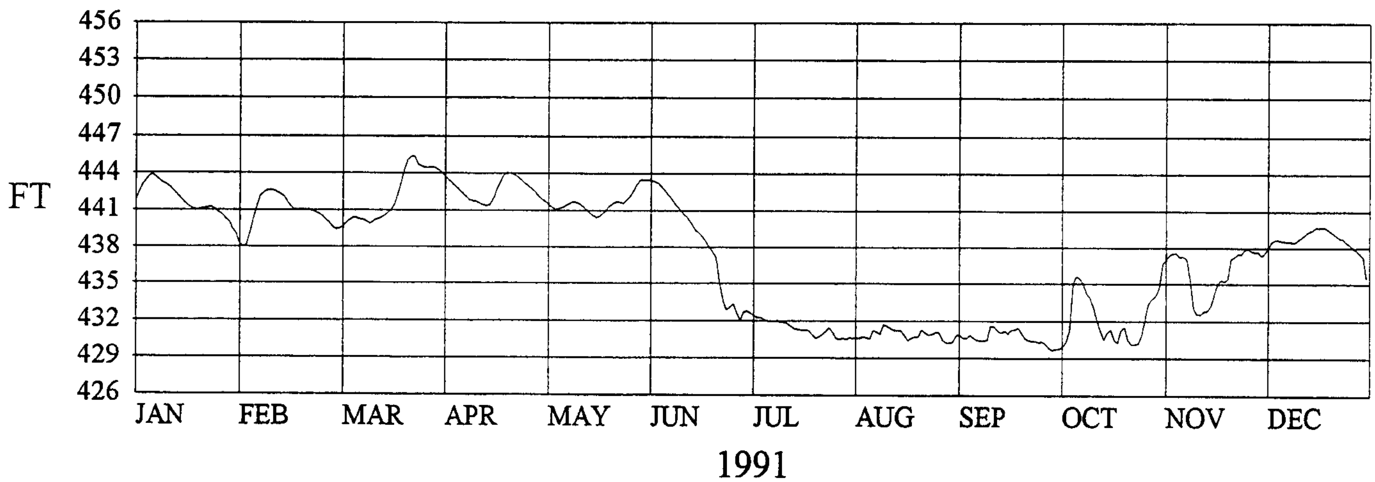
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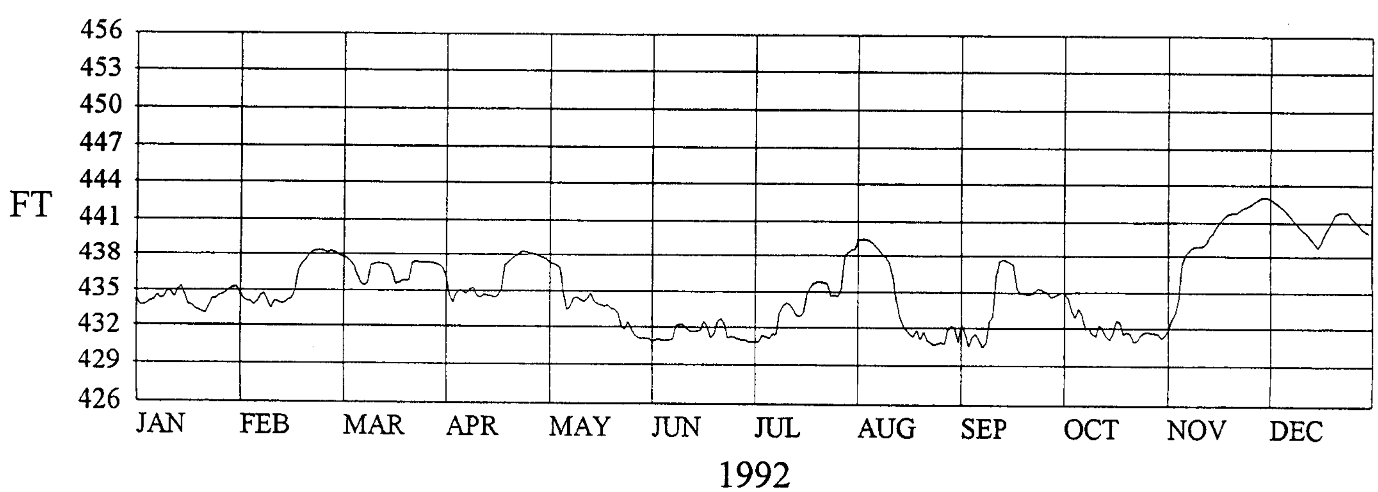
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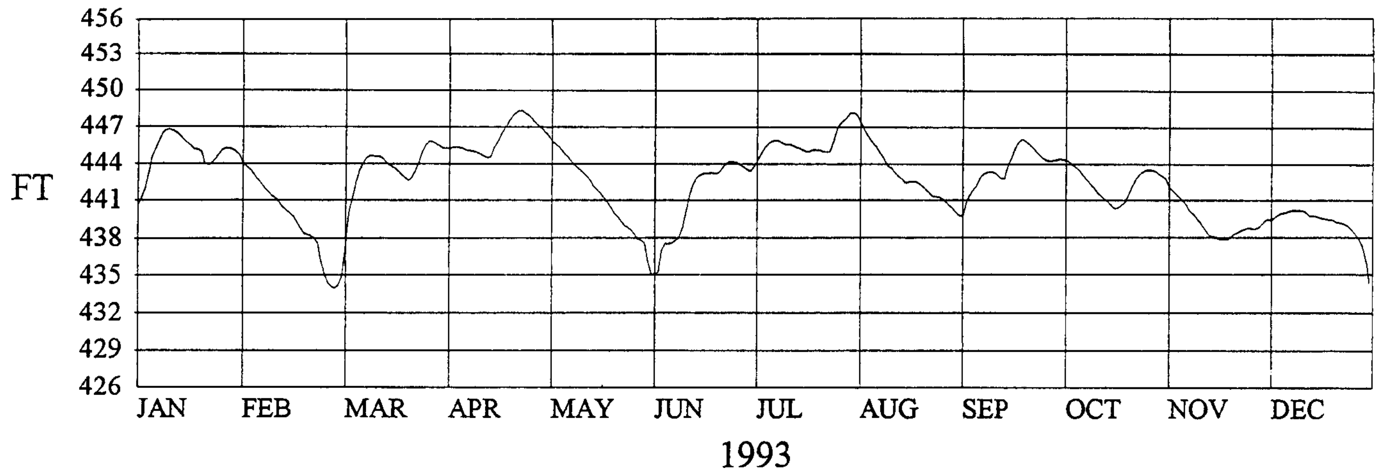
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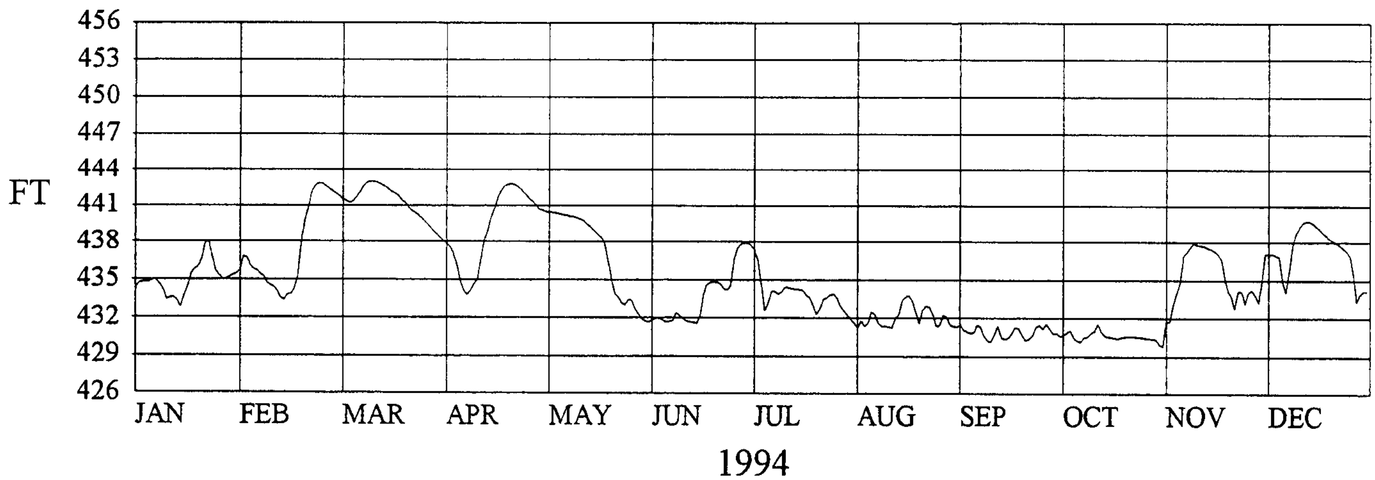
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1994

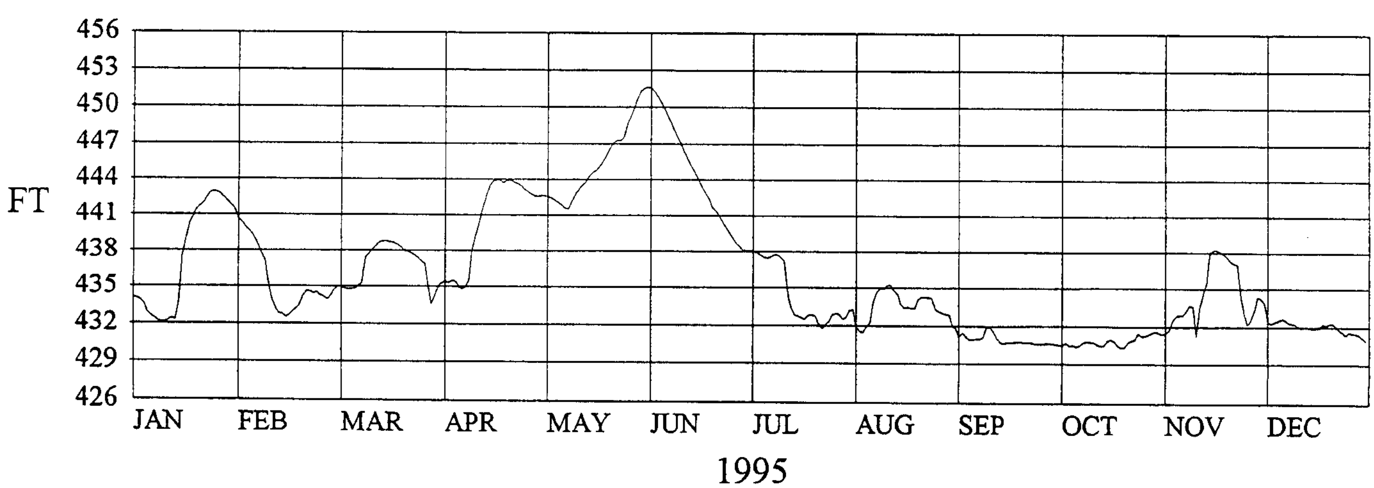
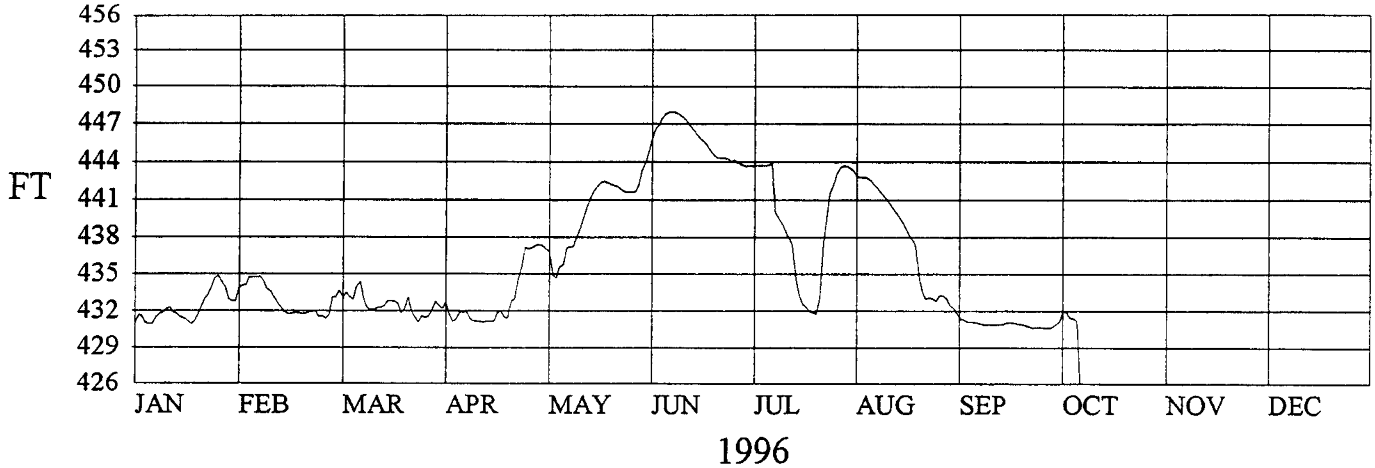
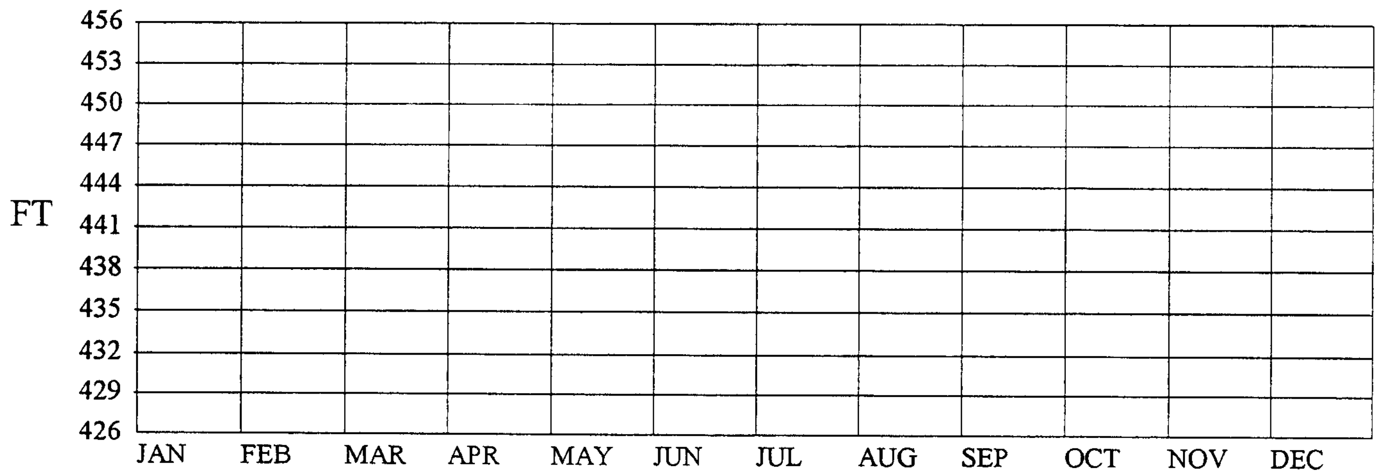
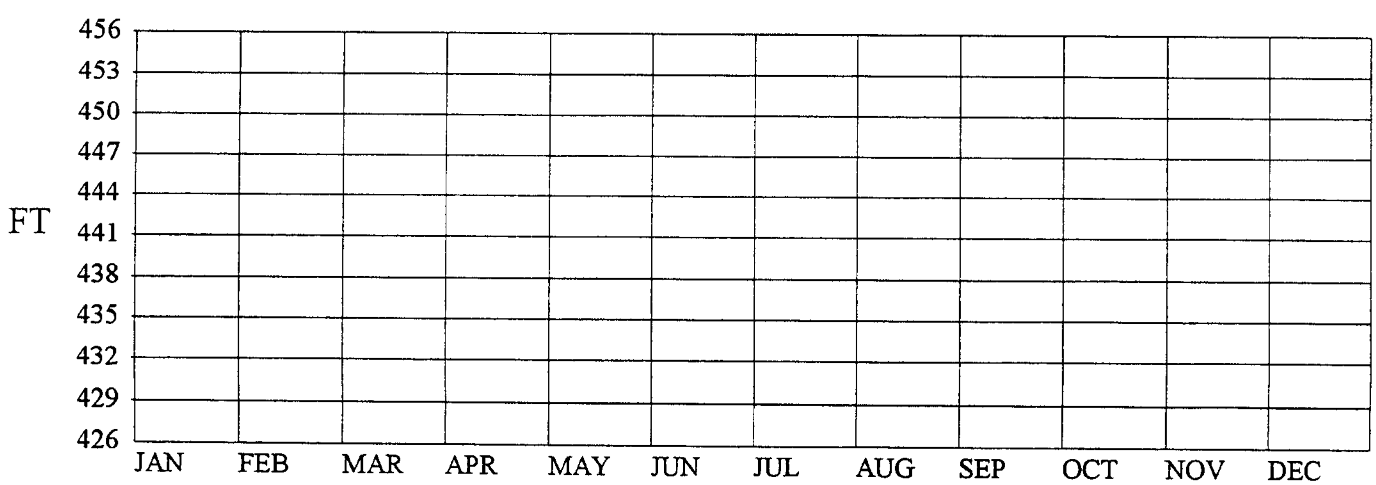

456
453
450
447
444
FT
441
438
435
432
429
426
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1995

PLATE G-13

COPPERAS CREEK

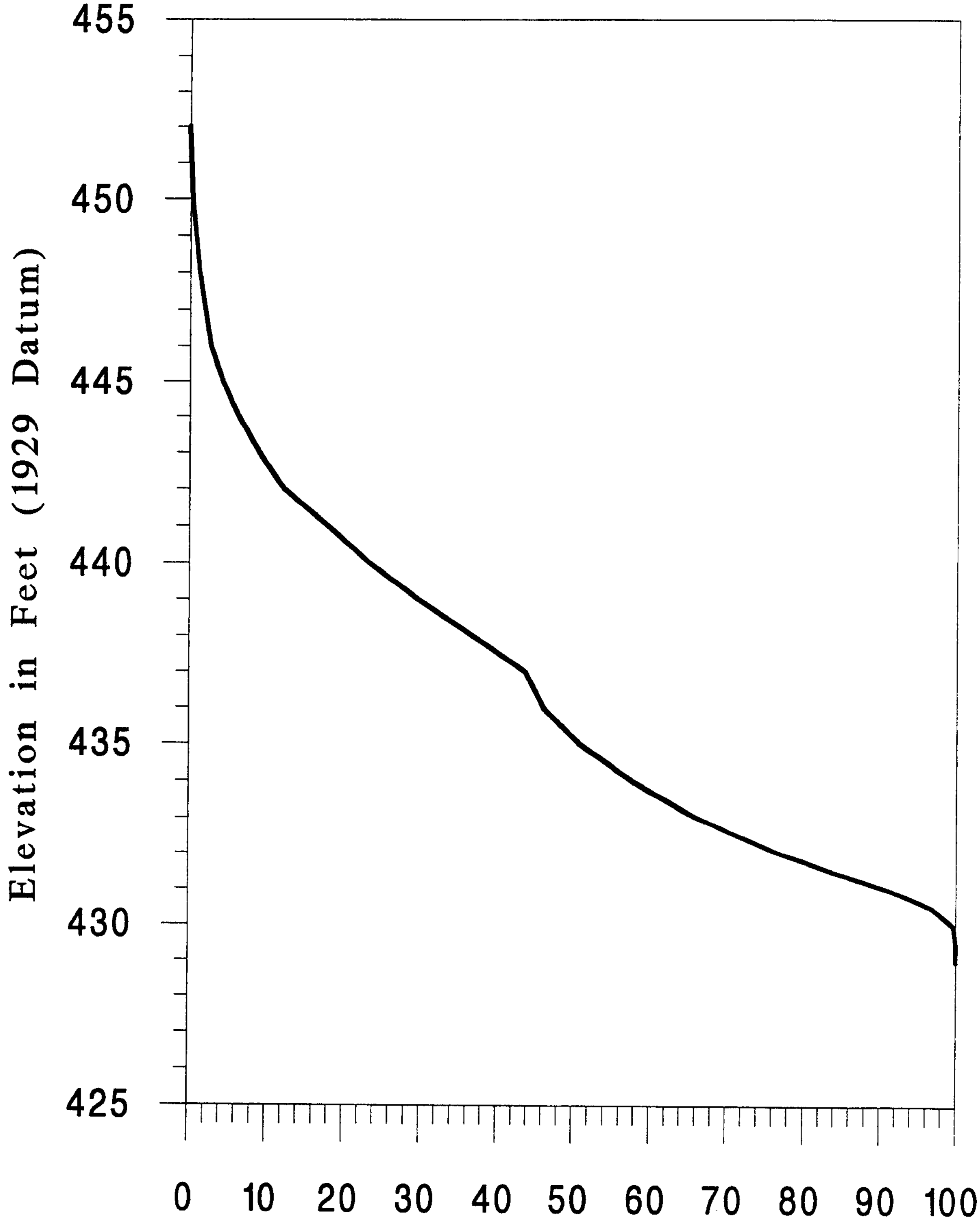






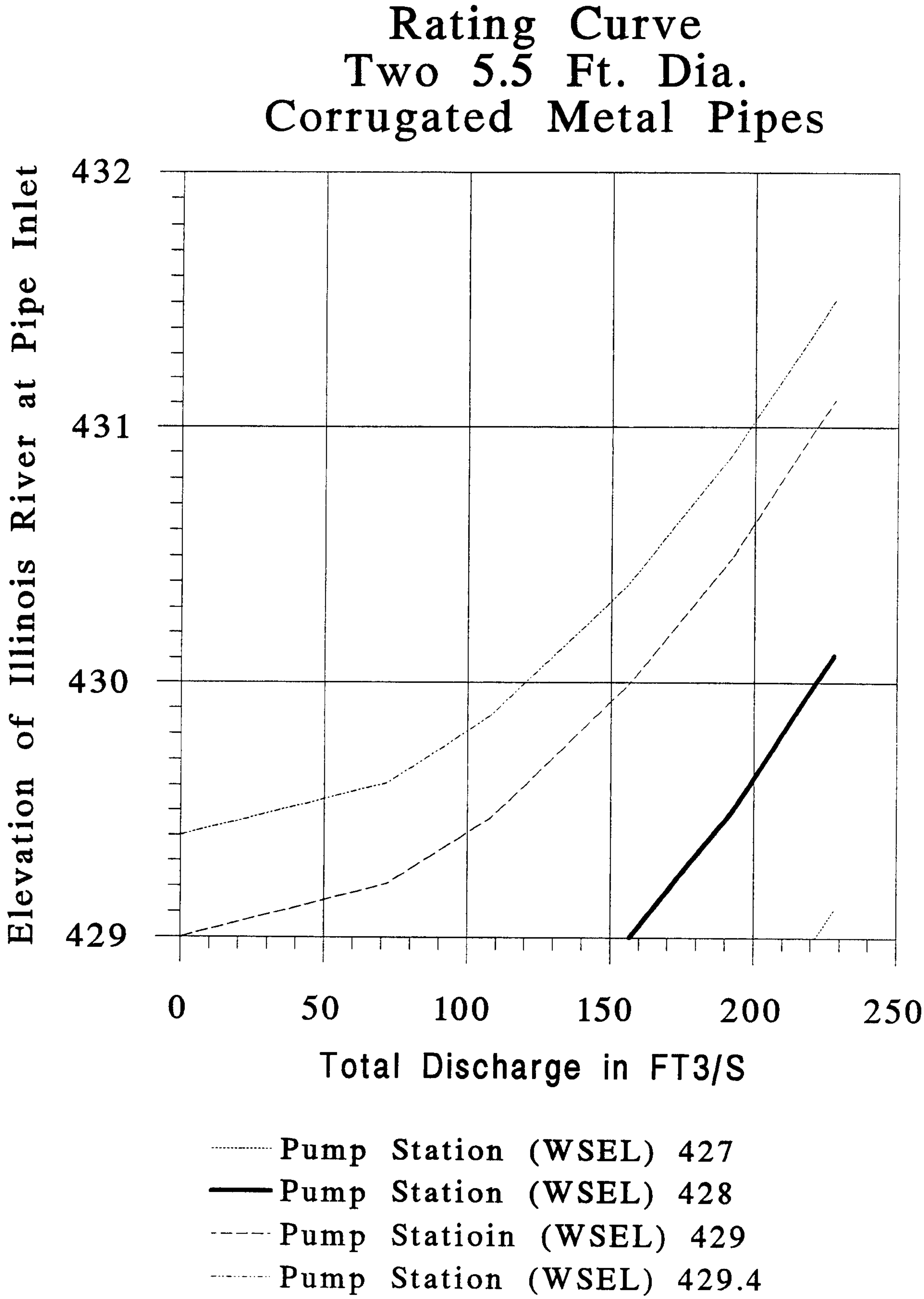
Stage Duration for Illinois River at Copperas Creek

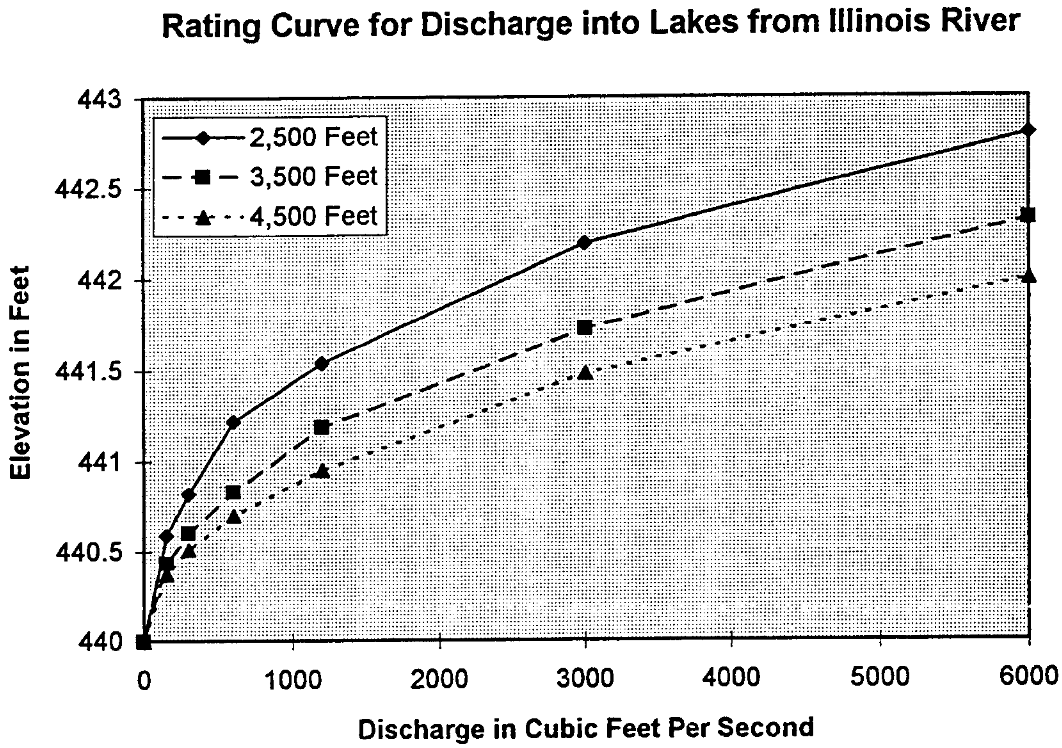
Year Round 1960 through 1994



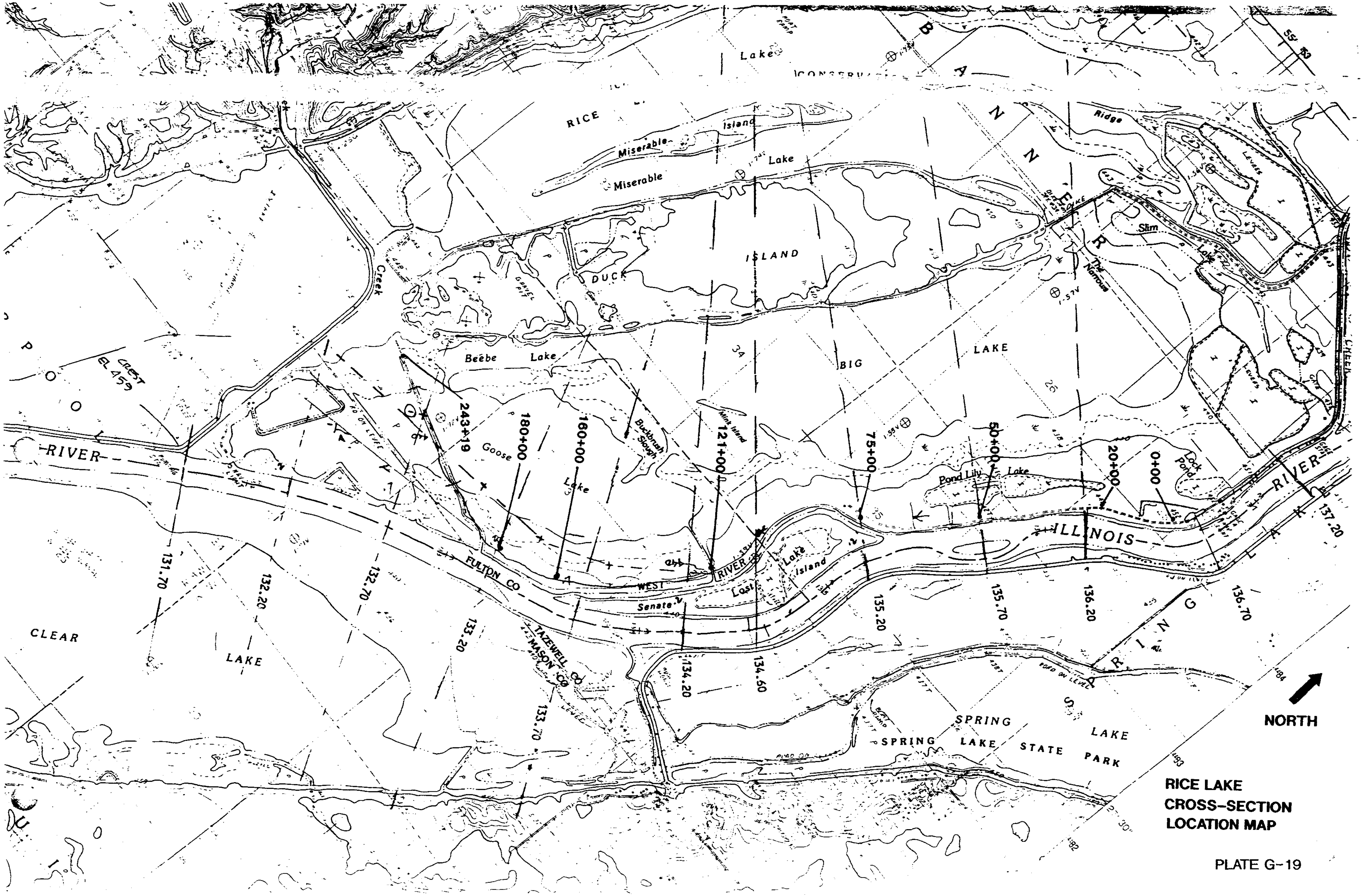
Yearly High and Low Stages at Copperas Creek Gage 1960-1996

YEAR	Highest Stage (Ft.)	Lowest Stage (Ft.)	Date Mo-Day	Days Below El 430	Other Below Days (Date)	Durations El 430 Days (Date)
1960	445.9	430.2	10-22			
1961	443.9	430.3	1-13			
1962	447.3	430.6	9-23			
1963	440.5	430.3	6-26			
1964	439.6	429.6	2-13	3	4 (8-14)	
1965	443.8	430.8	7-28			
1966	444.8	429.6	10-3	2		
1967	443.6	430.0	9-14			
1968	444.2	430.7	9-17			
1969	442.9	430.9	9-15			
1970	448.7	430.8	9-4			
1971	441.3	430.0	9-18			
1972	442.6	431.2	2-16			
1973	449.5	430.1	9-13			
1974	449.5	429.9	9-28	2		
1975	443.7	430.3	10-8			
1976	447.2	429.4	9-9	6	3 (9-22)	1 (10-30)
1977	441.4	429.9	6-27	1		
1978	444.7	430.2	10-11			
1979	452.0	430.3	9-19			
1980	445.2	430.8	11-20			
1981	446.4	431.3	11-21			
1982	450.8	430.6	10-2			
1983	449.5	429.2	10-9	1		
1984	446.4	430.6	10-31			
1985	452.0	431.0	10-9			
1986	445.8	430.7	8-24			
1987	441.5	429.8	10-10	1		
1988	443.0	429.5	10-7	5		
1989	441.79	430.1	11-4			
1990	445.73	430.6	10-2			
1991	445.4	429.7	9-28	5		
1992	443.05	430.5	9-6			
1993	448.35	433.9	2-28			
1994	443.04	429.8	10-30	2		
1995	451.66	430.4	10-18			
1996	447.97	430.9	9-11			


Rating Curve
Two 5.5 Ft. Dia.
Corrugated Metal Pipes
Elevation of Illinois River at Pipe Inlet
432
431
430
429
0
50
100
150
200
250
Total Discharge in FT3/S
Pump Station (WSEL) 427
Pump Station (WSEL) 428
Pump Statioin (WSEL) 429
Pump Station (WSEL) 429.4



Rating Curve for Discharge into Lakes from Illinois River
443
442.5
442
441.5
441
440.5
440
0
1000
2000
3000
4000
5000
6000
Elevation in Feet
Discharge in Cubic Feet Per Second
2,500 Feet
3,500 Feet
4,500 Feet



RICE LAKE CROSS-SECTION LOCATION MAP

PLATE G-19

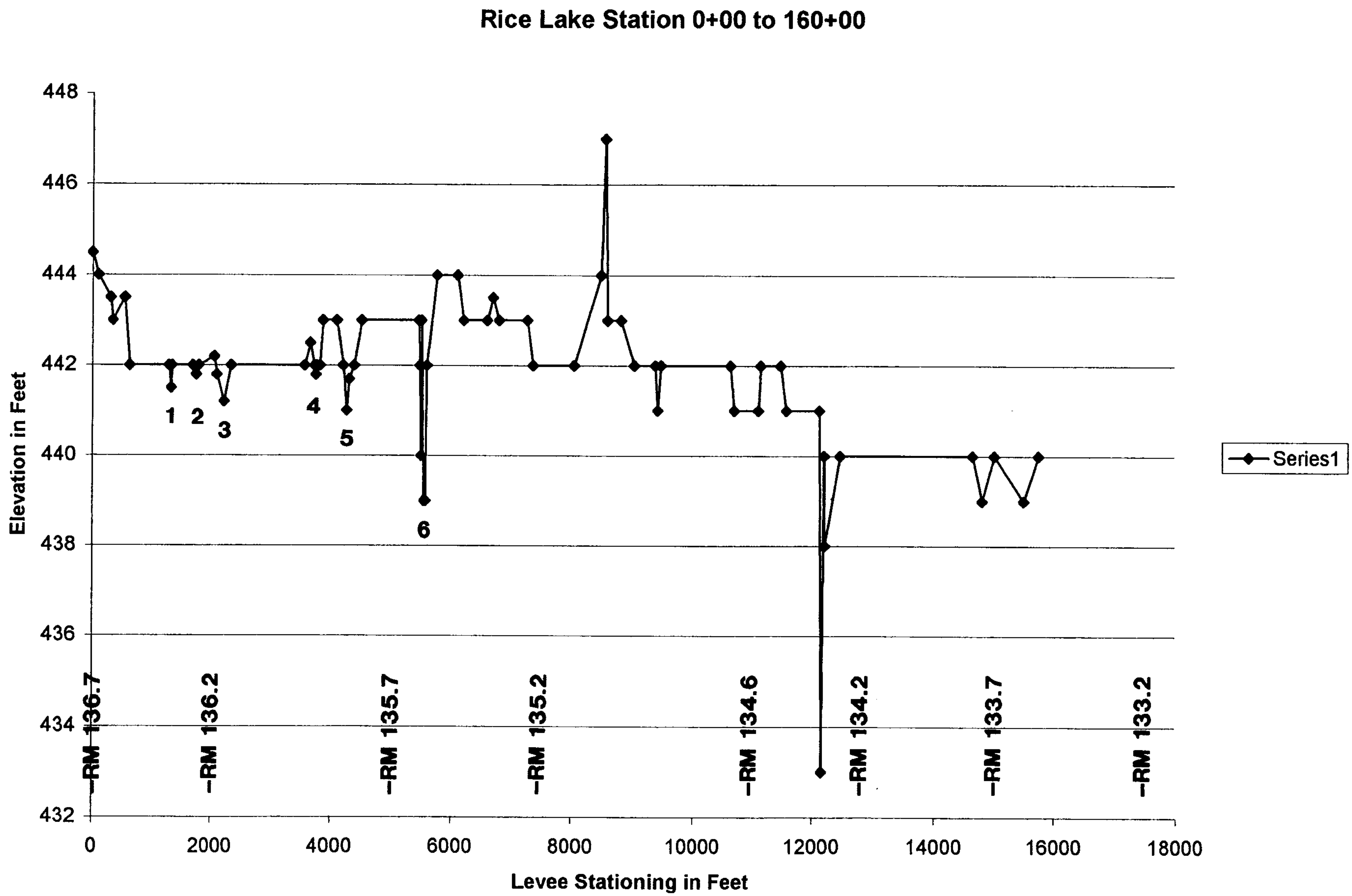

Rice Lake Station 0+00 to 160+00
Elevation in Feet
Levee Stationing in Feet
Series1
448
446
444
442
440
438
436
434
432
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
1
2
3
4
5
6
-RM 136.7
-RM 136.2
-RM 135.7
-RM 135.2
-RM 134.6
-RM 134.2
-RM 133.7
-RM 133.2

PLATE G-20

STRUCTURAL CONSIDERATIONS

A
P
P
E
N
D
I
X

H

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17D)

RICE LAKE STATE FISH AND WILDLIFE AREA
HABITAT REHABILITATION AND ENHANCEMENT

LA GRANGE POOL, ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

APPENDIX H
STRUCTURAL CONSIDERATIONS

GENERAL

This appendix presents the design of the structures in the project to illustrate typical calculations which will be undertaken to complete the structural design for final plans and specifications. Computations are shown for the pump station and the intake structure.

CRITERIA

The reinforced concrete hydraulic structures in the project will be designed following the current ACI Building Code and ETL 1110-2-312, Strength Design Criteria for Reinforced Concrete Hydraulic Structures. The few miscellaneous structural steel items in the project will be designed in accordance with EM 1110-1-2101, Working Stresses for Structural Design.

MATERIAL SELECTION

Concrete structures will be designed for 28-day compressive strength of 4,000 psi. concrete reinforcement will be deformed billet-steel bars conforming to ACI 615, grade 60 requirements. Structural steel will meet ASTM-A36, and steel sheet piling will meet ASTM-A328.

PUMP STATION

The pump station is designed to pump from either the Illinois River or from the channel feeding Big Lake and Rice Lake. This will be accomplished by opening or closing the appropriate sluice gates. There can also be gravity drainage through the pump station. Trash racks will be provided on both the river and lake sides to protect the pumps. The operating level will be above the 100-year flood elevation. The electrical control panels will be protected inside a concrete block building. The sluice gates will be operated by a gasoline or electrical portable operator. The pump station was checked to resist buoyancy and shall be supported on timber piling. Both a 2-pump and 3-pump station were designed. Electrically driven submersible propeller pumps were used for both designs.

INTAKE STRUCTURE

The intake structure was designed to resist sliding and will rest on top a sheet pile cell. A cantilever sheet pile retaining wall will be placed on both sides of the intake structure. A low river stage of 429.0 feet was used for design with a pipe invert elevation of 421.0 feet. The top elevation of the structure is elevation 442.0 feet.

Subject: Rice Lake EMP		Date
Computed by: chJ	Checked by	Sheet of

100,000 GPM Pump Station

	2 Pumps	3 Pumps
Gallons/min.	50,000	33,333
cu. ft/sec	111.4	74.3
Pump No.	7140 (64")	7101 (48")
Length of sump (L)	21.0 ft.	16.0 ft.
Width of sump (W)	10.67 ft.	8 ft.
Bottom of pump to floor (C)	2.67 ft	2.0 ft.
Min. Submergence (S)	5.8 ft.	4.7 ft.
Min. Water depth (C+S)	8.47 ft.	6.70 ft.
Min Sump Elevation	428.0 ft	428.0 ft
Floor Elevation	419.5 ft	421.0 ft

NCR Form 381b
1 Aug 80

Subject		Date
Rice Lake - EMP		
Computed by C. Johnson	Checked by	Sheet of

Two Pumps | **Three Pumps**

Two Pumps	Three Pumps
50,000 GPM	33,330 GPM
111.4 $\frac{cu.ft}{sec}$	74.3 $\frac{cu.ft}{sec}$

Gate:

Two Pumps	Three Pumps
7'x7' → 2.27 ft/sec	
5.5'x6.5' → 2.64 "	
6'x6' → 3.09 "	6'x6' → 2.06 ft/sec
5.5'x5.5' → 3.68 "	5.5'x5.5' → 2.46 "
5'x5' → 4.46 "	5'x5' → 2.97

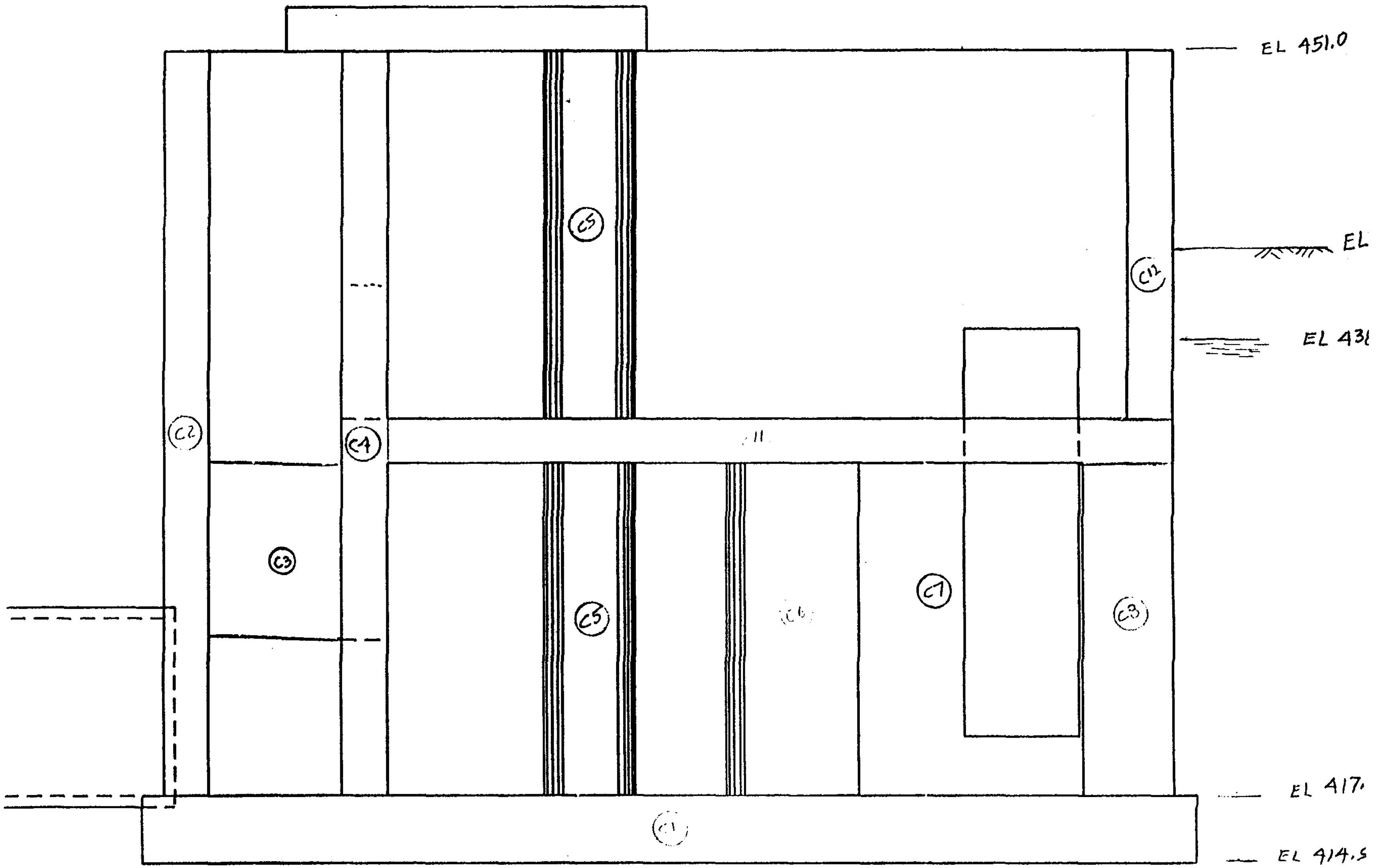
River Intake pipes 2 - 5.5' ϕ → $\frac{222.8}{47.52}$ = 4.69 ft/sec

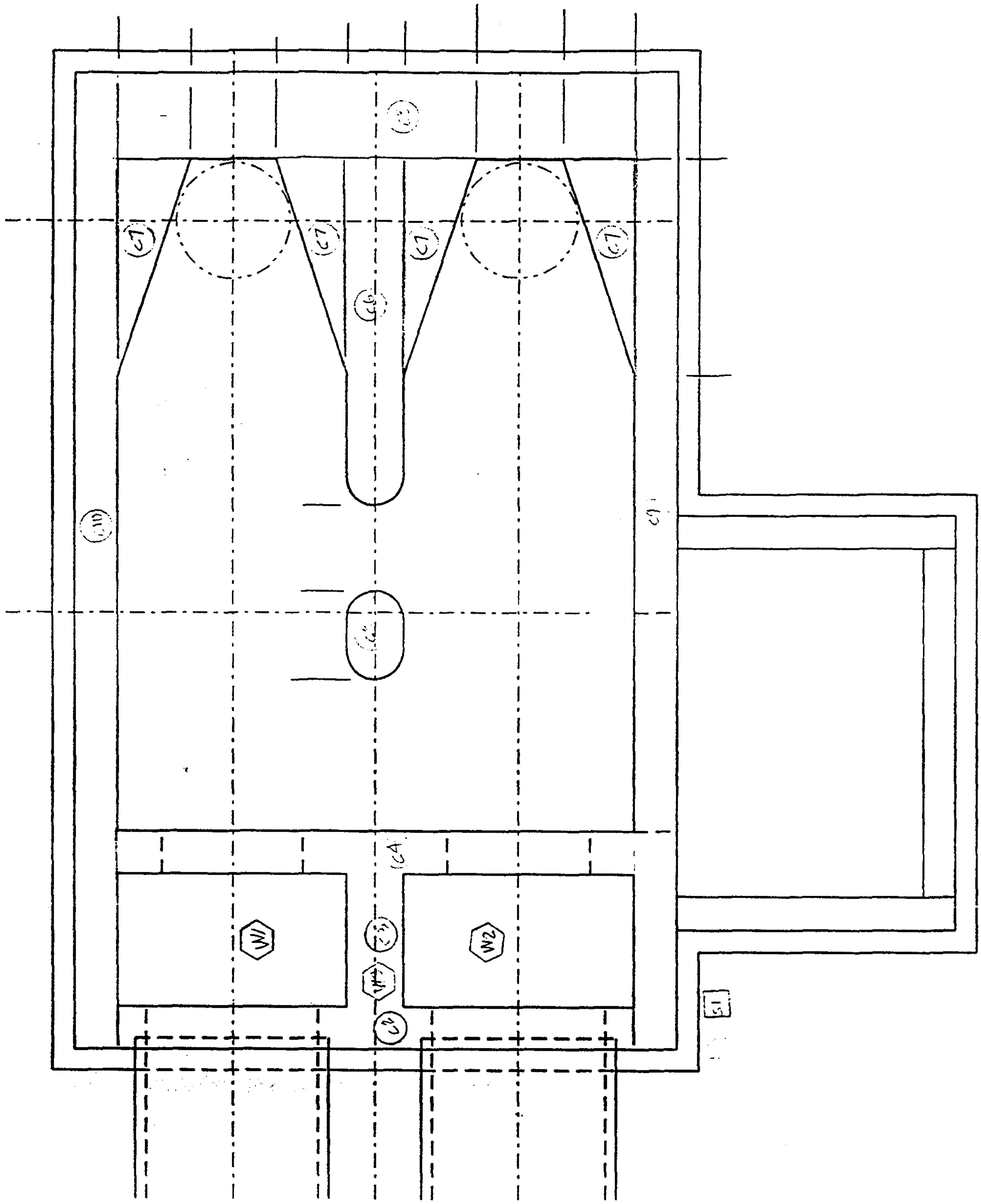
Intake and Discharges 100,000 GPM = 222.8 $\frac{cu.ft}{sec}$

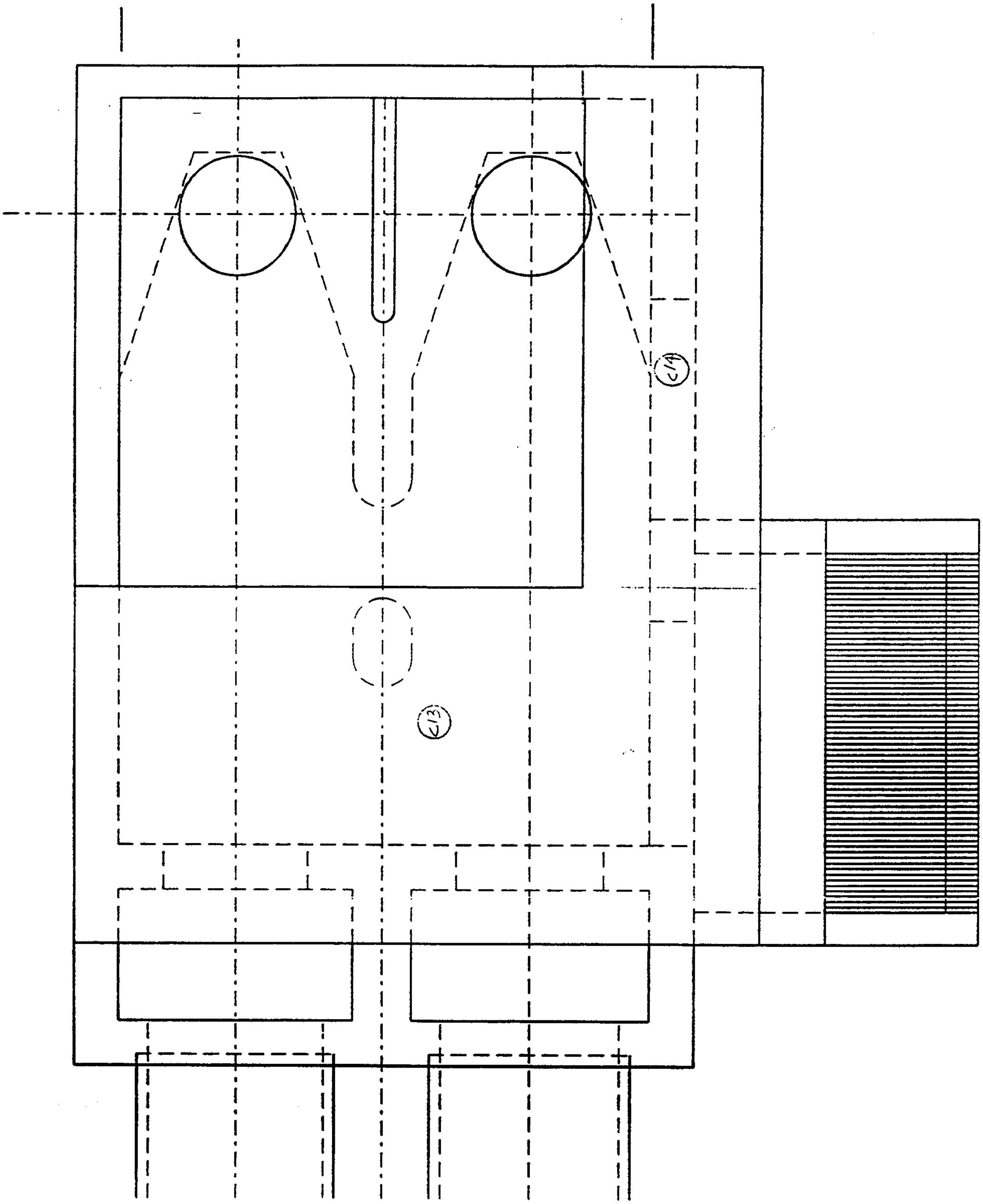
One	Two
8'x10' → 2.78 ft/sec	5'x5' → 4.45
6'x10' → 3.71 ft/sec	
5'x10' → 4.45 ft/sec	

NCR Form 381b
1 Aug 80

Pump Station
2 - Pumps


EL 451.0
EL
EL 43
EL 417.
EL 414.5
C1
C2
C3
C4
C5
C5
C6
C7
C8
C12


C10
C7
C7
C7
C7
C4
W1
C3
W4
W2
C2
S1


c14
c13

Subject: Rice Lake Pump Station - 2 Pump		Date: Nov 96
Computed by: C. Johnson	Checked by	Sheet of

Concrete

C1	47*30*3*150	634,500
C2	2*24*33.5*150	241,200
C3	6*2*8*150	14,400
C4	2*(24*33.5-(2)*7*7-(1)(10*6))*150	193,800
C5	$(\pi*1^2+2*2)(15+16.5)*150$	33,744
C6	$(1/2*\pi*1^2+15*2)*15*150$	71,034
C7	(4)*1/2*10*3.5*15*150	157,500
C8	4*24*15*150	216,000
C9	2(45*33.5-10*6)*150	434,250
C10	2(45*33.5)*150	226,125
C11	35*24*2*150	252,000
C12	2*24*16.5*150	118,800
C13	31*16*2*150	148,800
C14	23.5*8*2*150	56,400
		2,798,553 lbs

Ignor intake area

Water Down

W1	6*11*18.5*62.5	76,312
W2	6*11*18.5*625	76,312
W3	6*2*7.0*62.5	5,250
		157,874

Soil & Water Down

S1	(30*47-28*45)*(20.5*125+4*110)	450,375
		3,406,802 lbs

Subject		Date
Rice Lake Pump Station - 2 Pump		Nov 96
Computed by C. Johnson	Checked by	Sheet of

U1 Uplift

$$(30*47)(438-414.5)*62.5 = 2,070,938 \text{ lbs}$$

Flotation Safety Factor (sumps dewatered)

$$\frac{3,406,802}{2,070,938} = 1.64 \text{ F.S.} > 1.3$$

EM 1110-2-3104
30 Jun 89, page 4-14

Soil Pressure Construction Condition

$$\sigma = \frac{2,798,553}{30*47} = 1,985 \text{ psf}$$

Soil Allowable Bearing Capacity

"Foundation Engineering" 2nd Ed. Peck, Hanson, & Thornburn

page 271

$$D_f/B = \frac{(542-516.5)}{49} \approx 0.5 \rightarrow N_c = 7.0 \quad (\text{fig } 18.2,\ B/L = 1)$$

$$q_u = 0.5 \text{ Tons/sq. ft.}$$

$$q_a = \frac{q_u N_c}{6} = \frac{1000*7.0}{6.0} = 1,167 \text{ lbs/sq. ft.} < 1,985 \text{ lbs/sq. ft.}$$

use: pile foundation

Try 20 ton timber piles

$$\frac{2,798,553}{40,000} = 70 \text{ piles}, \text{ provided } 77 \text{ piles}$$

NCR Form 381b
1 Aug 80

FOUNDATION SOILS INFORMATION CHART

Soil Description	Mean N-Value	Range* of N-Value	Estimated Allowable Bearing Value for Friction Piles in Tons Per Foot (Factor of Safety = 2.0)								
			Wood Pile	Steel 'H' Pile	Concrete Pile 16"	Concrete Pile 14"	Steel Shell Pile, Parallel Sided 18"	Parallel Sided 14"	Parallel Sided 12"	Parallel Sided 10"	Tapered 12"(Av.)
Alluvium or Loess											
ery soft silty clay	1	0-1	0.3	0.2	0.5	0.4	0.3	0.3	0.3	0.2	
oft silty clay	3	2-4	0.3	0.2	0.5	0.4	0.3	0.3	0.3	0.2	
tiff silty clay	5	3-7	0.5**	0.4	0.8	0.7	0.5	0.5	0.4	0.4	
tiff silt	5	3-7	0.5	0.4	0.8	0.7	0.5	0.5	0.4	0.4	
tiff sandy silt	5	4-8	0.5	0.4	0.9	0.8	0.5	0.5	0.4	0.4	
tiff sandy clay	6	4-8	0.7	0.6	0.9	0.8	0.6	0.6	0.5	0.4	
ilty sand	8	2-14	0.8	0.7	1.0	0.9	0.6	0.6	0.5	0.4	
layey sand	13	6-20	0.8	0.6	1.0	0.9	0.6	0.6	0.5	0.4	
ine sand	15	8-22	1.0	0.6	1.1	1.0	0.7	0.7	0.6	0.5	1.8
oarse sand	18	10-26	1.5	1.1	1.2	1.1	0.9	0.9	0.8	0.6	2.0
ravelly sand	20	11-29	2.0	1.5	1.8	1.6	1.3	1.2	1.0	0.9	2.5
Glacial Clays											
irm silty clay	11	7-15	1.0	0.7	0.9	0.8	0.7	0.6			
irm silty gl. clay	11	7-15	1.0	0.8	1.0	0.9	0.7	0.6			
irm clay (Gumbotil)	12	9-15	1.0	1.0	1.0	0.9	0.7	0.6			
irm glacial clay	11	8-14	1.5	1.0	1.1	1.0	0.9	0.8			
irm sandy gl. clay	13	9-17	1.5	1.2	1.2	1.1	0.9	0.8			
irm-very firm gl. clay	14	12-16	1.5	1.2	1.2	1.1	0.9	0.8			
ery firm gl. clay	24	16-32	1.8	1.6	2.0	1.8	1.4	1.3			
ery firm sandy gl. clay	25	15-35	1.8	1.6	2.0	1.8	1.4	1.3			

H-11

* Range = Mean ± 1 Std. Deviation.
** Underlined values determined from pile load tests to yield.

Date: January, 1967
Revised: May, 1971

Iowa State Highway Commission

Subject Rice Lake Pump Station - 2 Pump		Date Nov 96
Computed by C. Johnson	Checked by	Sheet of

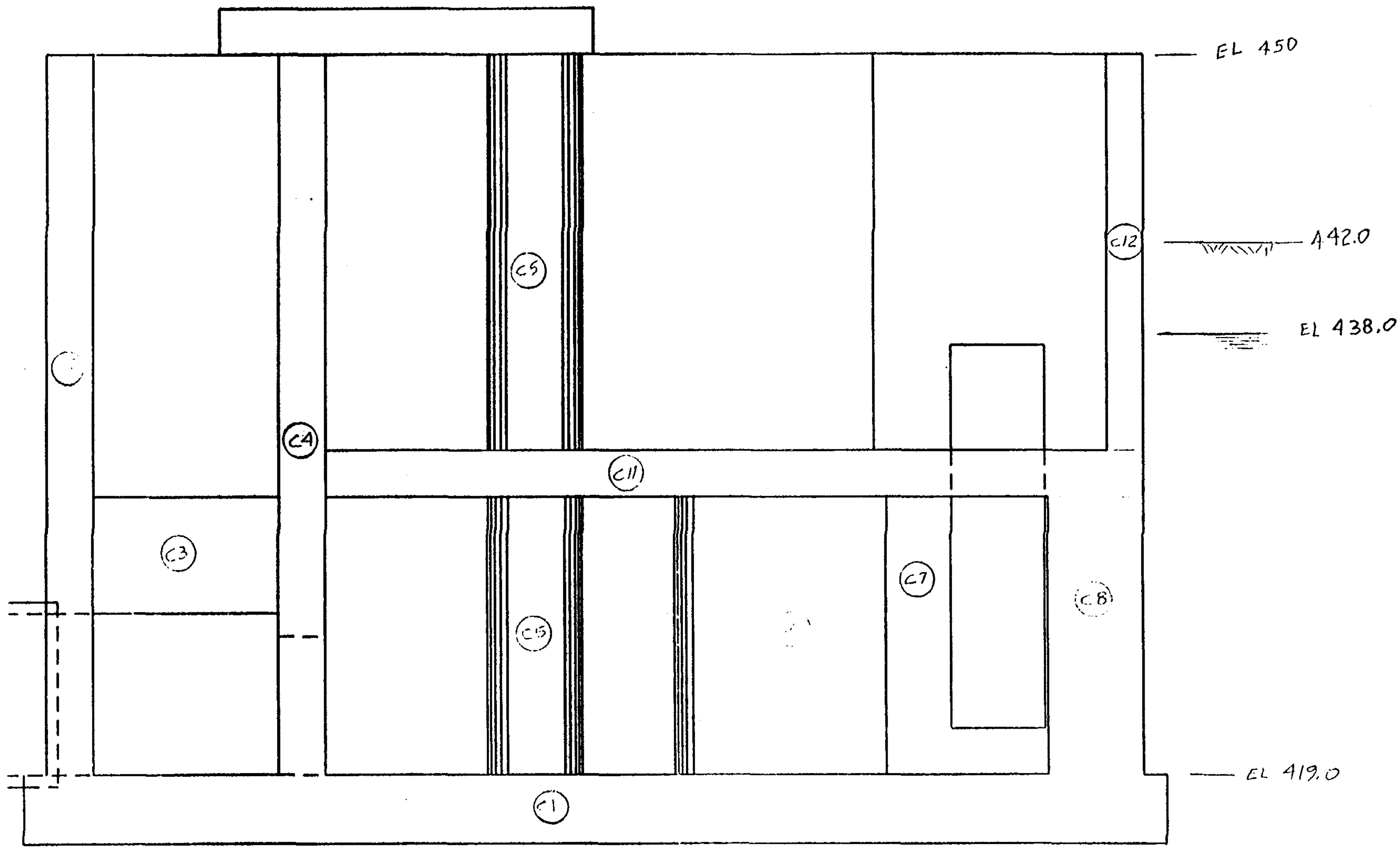
Determine length of pile (Rough)
"Iowa State Highway Commission

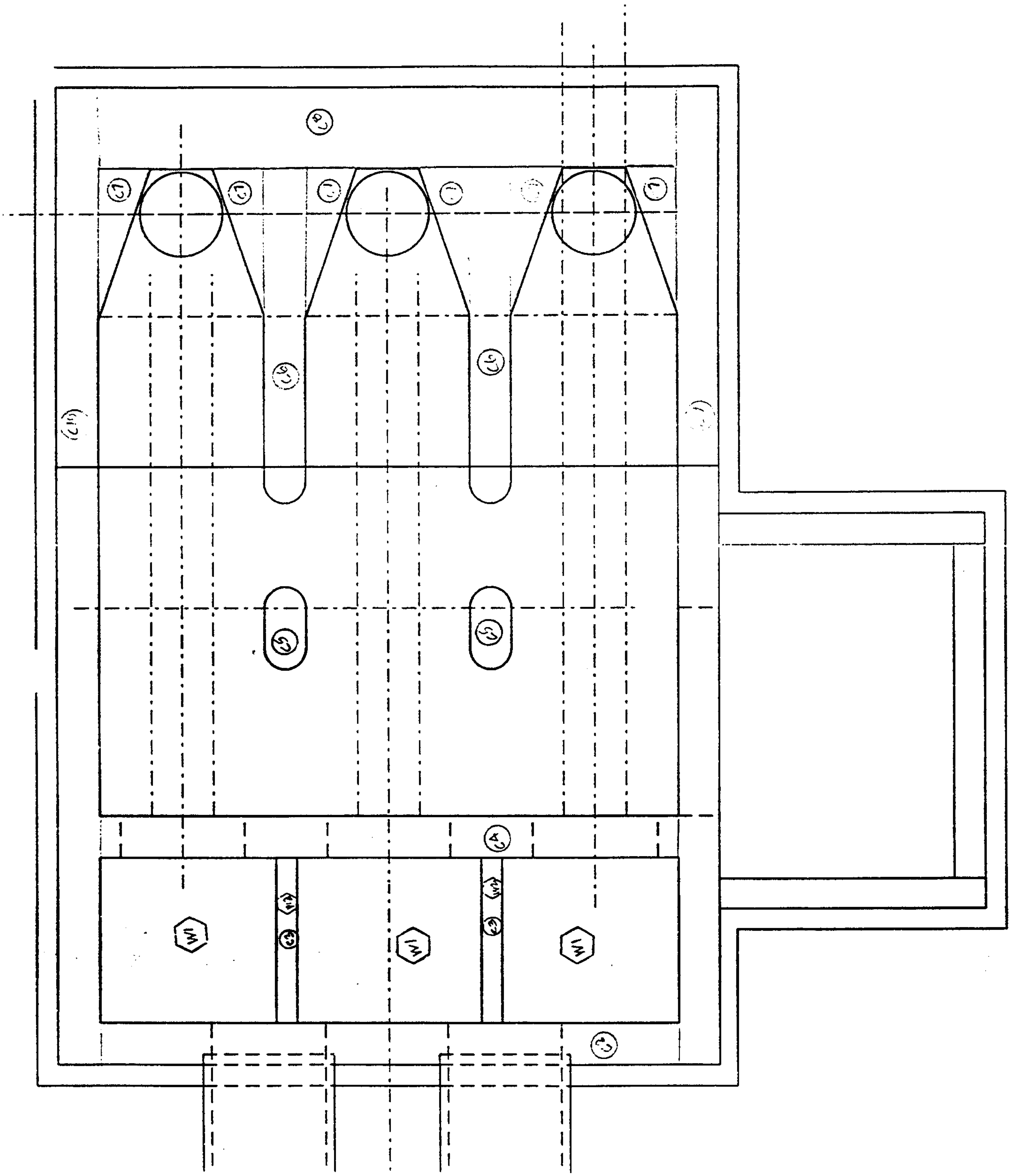
				Tons
12 ft	clay	N = 4	12 * 0.3 =	3.6
7.5 ft	fine sand	N = 2	7.5 * 0.8 =	6.0
6. ft	Coase to fine Sand	N = 30	6 x 2.0 =	12.0
25.5 ft.				21.6 tons

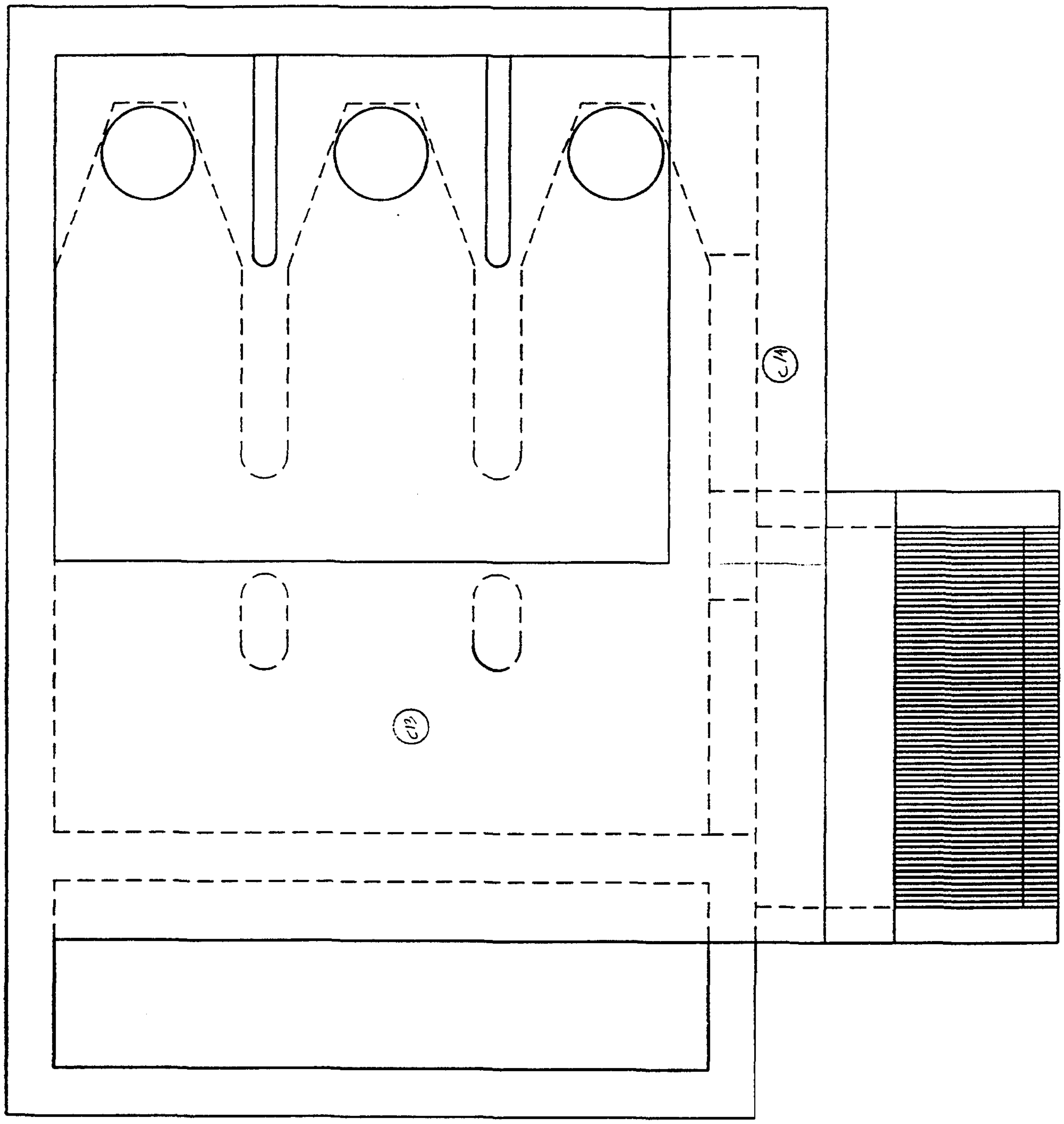
Use 26 foot long piles

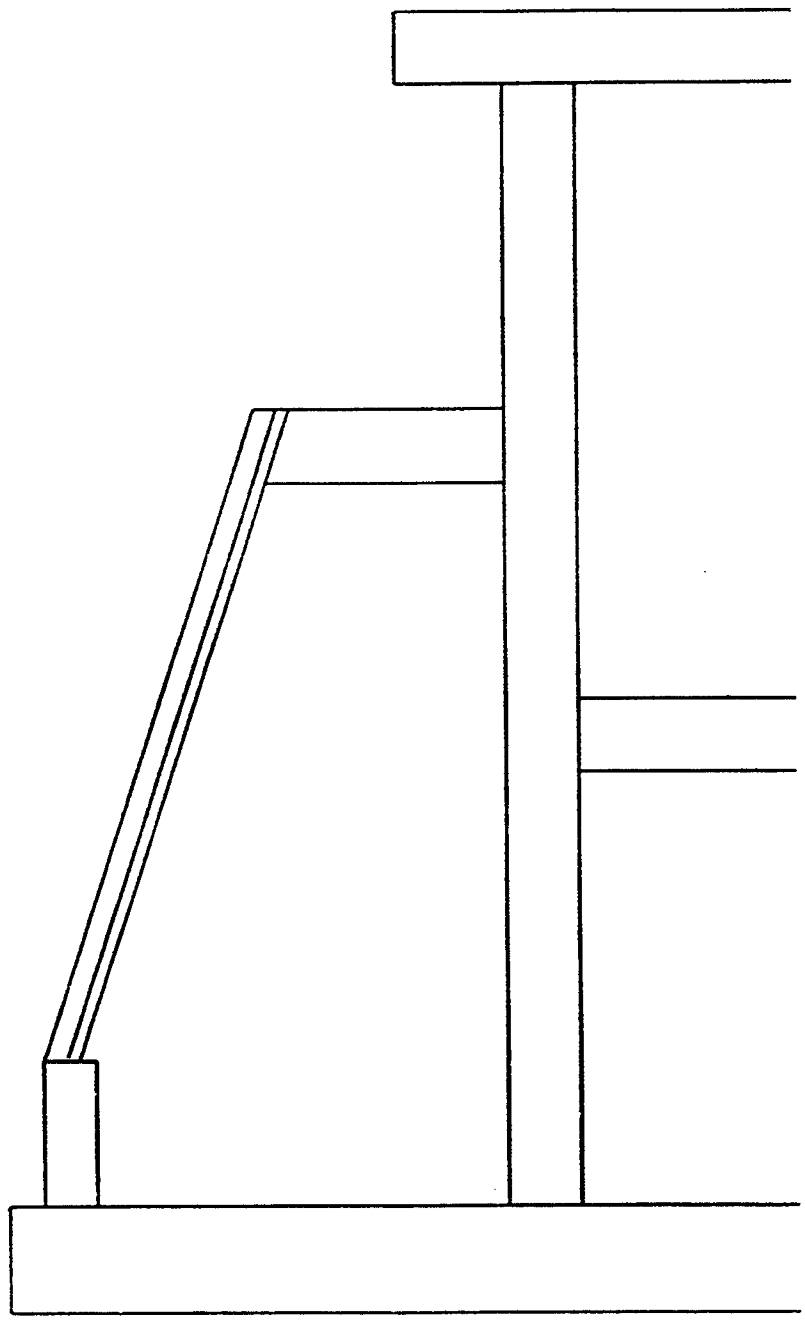
NCR Form 381b
1 Aug 80

Pump Station
3 - Pumps


EL 450
C12
442.0
EL 438.0
C5
C4
C11
C3
C7
C8
C5
EL 419.0
C1


W1
W1
W1
C3
C3
W2
C4
C5
C5
C6
C6
C7
C8
C2


C14
C13



SCALE:
12" 0

Subject		Date
Rice Lake Pump Station – 3 Pump		Nov 96
Computed by C. Johnson	Checked by	Sheet of

Concrete

		(lbs)
C1	49 * 34 * 3 * 150	749,700
C2	2 (28 * 31 − (2) * 5.5²/4 * π) * 150	246,145
C3	(2) * 1 * 5 * 8 * 150	1,200
C4	2 * (28 * 31 − (3) * 6 * 6 − (1) * 10 * 6) * 150	210,000
C5	(2) * (π * 1² + 2 * 2)(12 + 17) * 150	62,132
C6	(2)(½ * π * 1² + 15 * 2) * 12 * 150	113,655
C7	(6)(½ * 7 * 2.5) * 12 * 150	94,500
C8	4 * 28 * 12 * 150	201,600
C9	2 * (47 * 31 − (2)(10 * 6)) * 150	401,100
C10	2 * (47 * 31) * 150	437,100
C11	35 * 28 * 2 * 150	294,000
C12	2 * 17 * 28 * 150	142,800
C13	2 * 35 * 16 * 150	168,000
C14	2 * 6.75 * 23.5 * 150	47,588
		3,169,520 lbs

Ignor Intake Area

Water Down

W1	8 * (8.5 + 9 + 8.5) * (438 − 419) * 62.5	247,000
W2	2 * (1 * 8)(438 − 419 − 5) * 62.5	14,000
		261,000 lbs

Soil & Water Down

S1	(34 * 49 − 32 * 47)(19 * 125 + 4 * 110)	456,030 lbs
		3,886,550 lbs

Subject: Rice Lake Pump Station – 3 Pump		Date: Nov 96
Computed by: C. Johnson	Checked by	Sheet of

Uplift

UI $(34*49)(438-416.0)*62.5 = 2,290,750$ lbs

Flotation Safety Factor (sump dewatered)

$$\frac{3,886,550}{2,290,750} = 1.70 > 1.3$$ EM 1110-2-3104 30 Jun 89, page 4-14

Soil Pressure Construction Condition

$$\sigma = \frac{3,169,520}{34*49} = 1,902 \text{ psf}$$

soil pressure ≈ the same as for 2-pump station

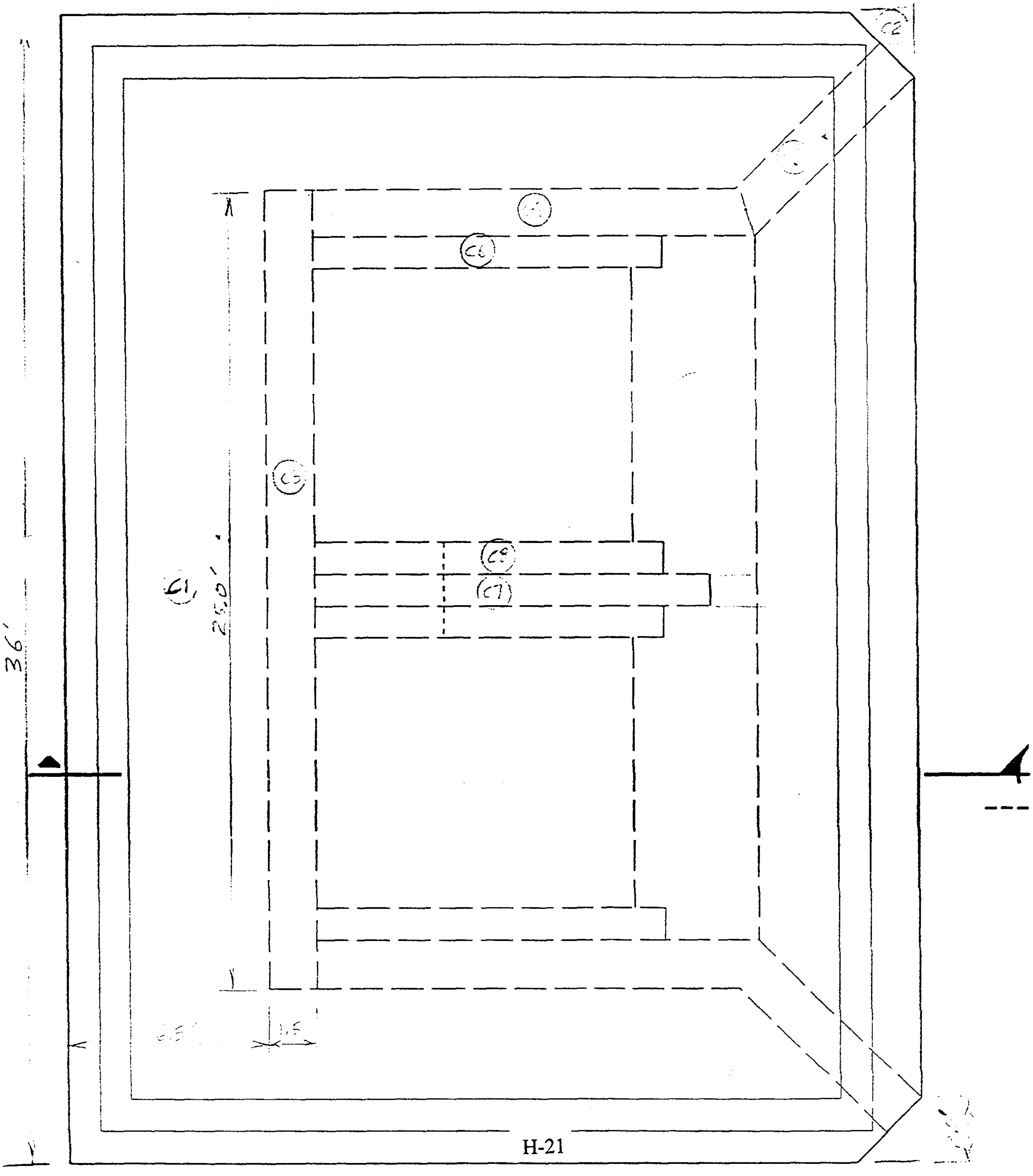
Use: pile foundation

Try 20 ton timber piles

$$\frac{3,169,520}{40,000} = 79 \text{ piles}$$, provided 77 piles

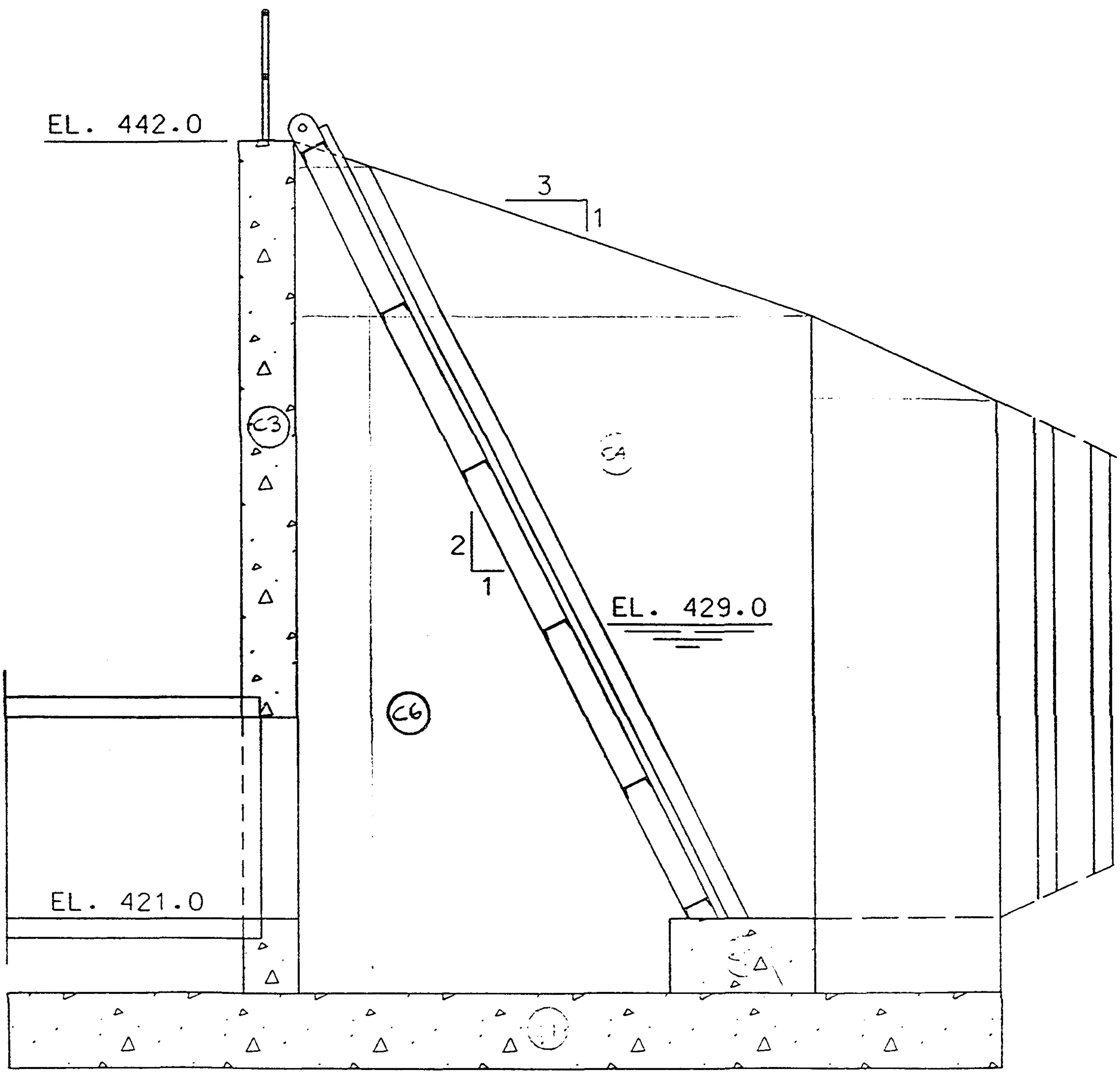
NCR Form 381b
1 Aug 80

Intake Structure



PLAN

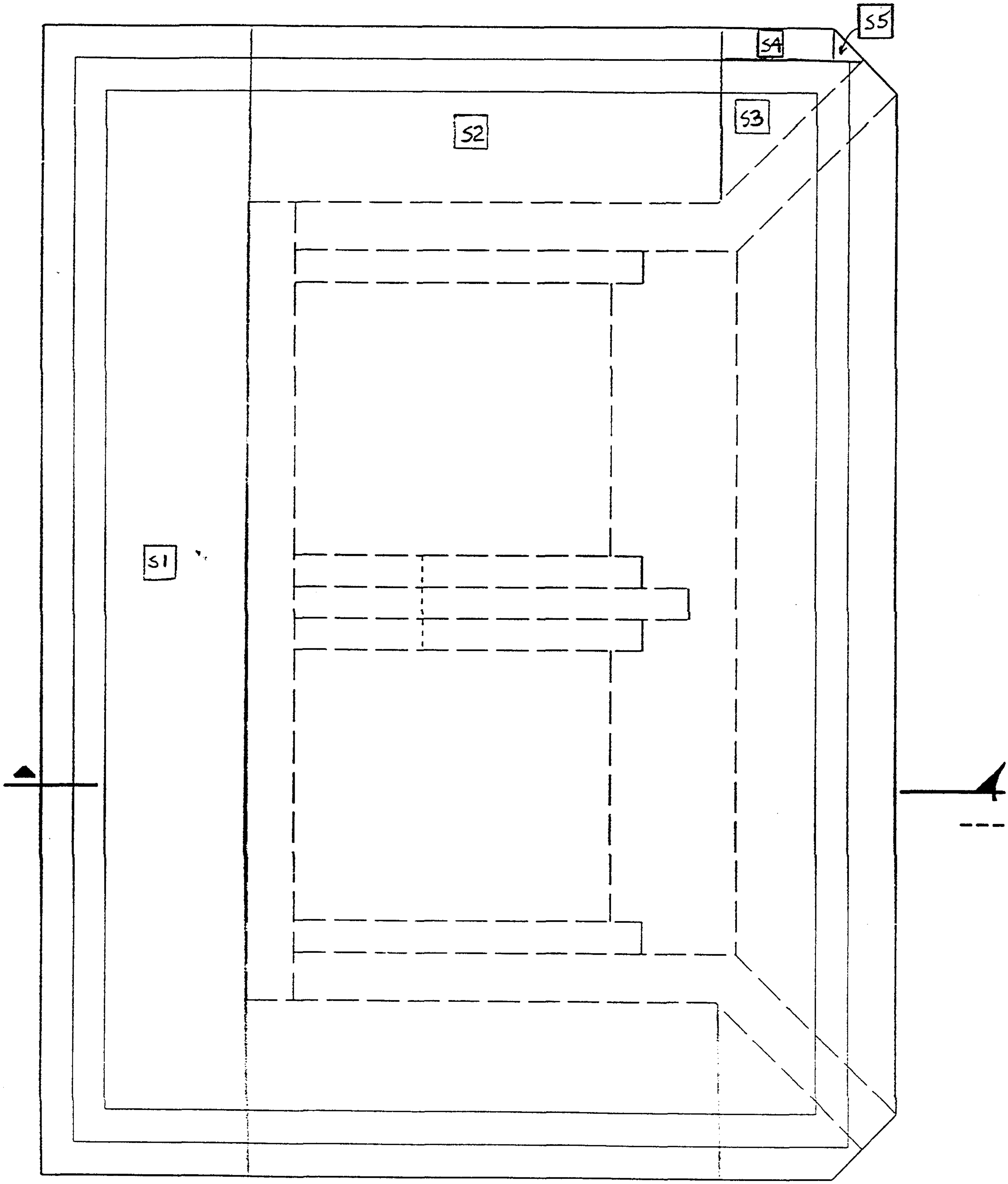
INTAKE FROM 3-PUMP



Subject: Rice Lake - Intake Structure	Date: Dec 96
Computed by: C. Johnson / Checked by:	Sheet of

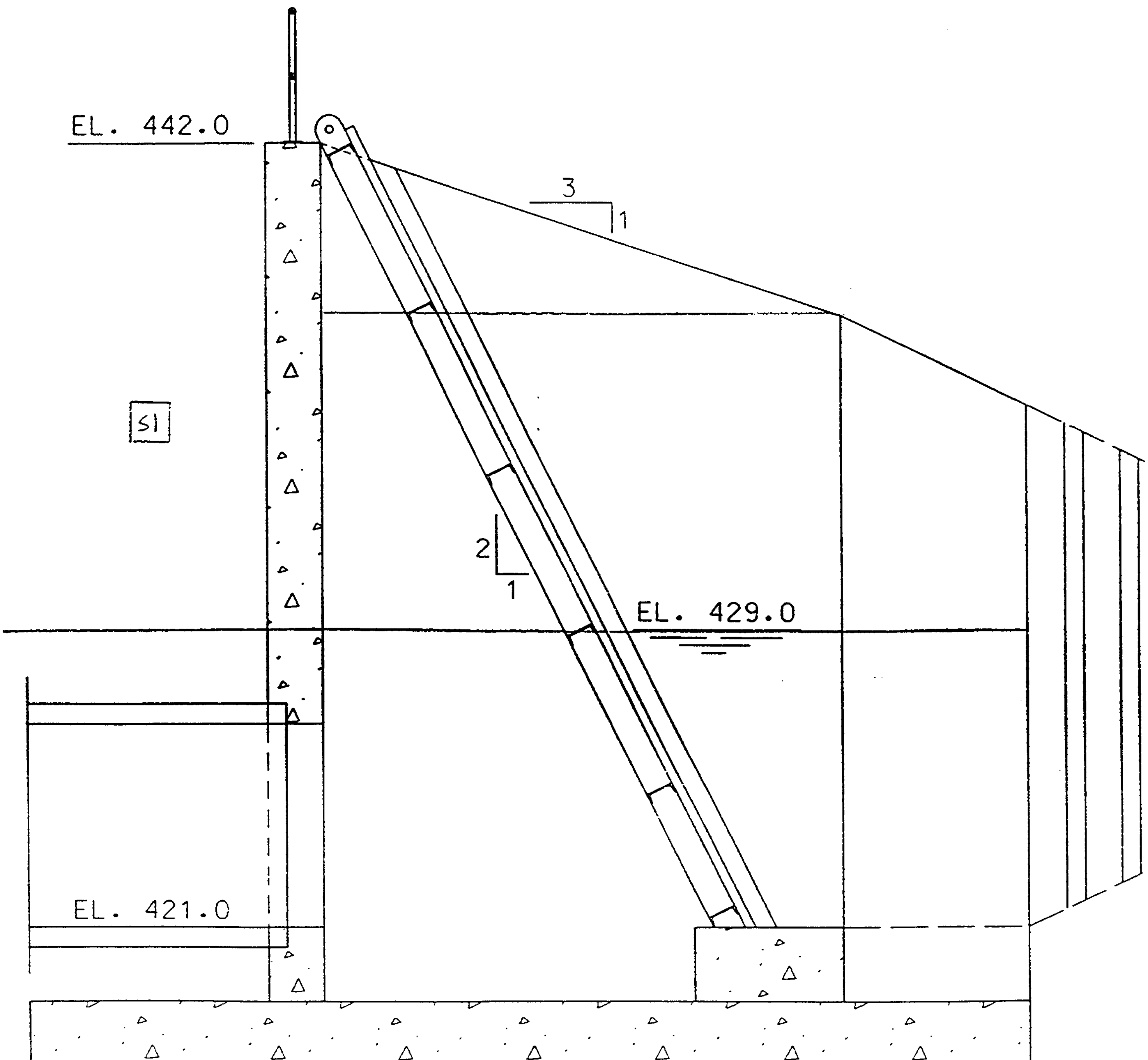
Concrete	Force (lbs)	Arm (ft)	Moment (ft-lbs)
C1 36*27*2*150	291,600	13.5	3,936,600
C2 (2)*½*2²*2*150	-1,200	26.33	-31,596
C3 25*1.5*23*150	129,375	7.25	937,969
-(2)*1.5*π/4*5.5²*150	-10,691	7.25	-77,511
C4 (2)*13.75*1.5*18.33*150	113,417	15.0	1,701,253
+(2)*½*13.75*1.5*4.67*150	14,448	12.67	183,054
C5 (2)*6.75*16.0*1.5*150	48,600	≈ 24.2	1,176,120
+(2)*½*6.75*2.33*1.5*150	3,539	≈ 23.3	82,459
C6 (2)*½*23*11.5*1*150	39,675	11.83	469,355
C7 1*23*2*150	6,900	9.0	62,100
-½*2*0.67*1*150	-100	9.33	-933
½*22.33*1*11.16*150	18,690	13.72	256,430
C8 (2)*½*23*11.5*1*150	39,675	11.83	469,355
C9 4*2*(22-1)*150	25,200	20.0	504,000
	719,128		9,668,650

NCR Form 381b
1 Aug 80



PLAN

INTAKE FROM 3-PUMP



Subject		Date
Rice Lake - Intake Structure		Dec 96
Computed by	Checked by	Sheet of

Soil & Water Down

Assume $\gamma_{sat} = 125$

	Force (lbs)	Arm (ft)	Moment (ft-lbs)
S1 23*6.5*36*125	672,750	3.25	2,186,438
-(2)* 5.5²*π/4*6.5*125	-38,607	3.25	-125,473
S2 (2)*15*5.5*18.5*125	381,562	14.0	5,341,875
+(2) 1.5*5.5*4.5*125	9,281	7.25	67,289
+(2)*½* 13.5*4.5*5.5*125	41,766	12.5	522,070
S3 (2)*½*4.5*4.5*17.5*125	44,297	23.75	1,052,051
S4 (2)* 1*3.5*17.5*125	15,312	23.25	356,016
S5 (2)*½*1*1*16.5*125	2,062	25.33	52,243
	1,128,423		9,452,509

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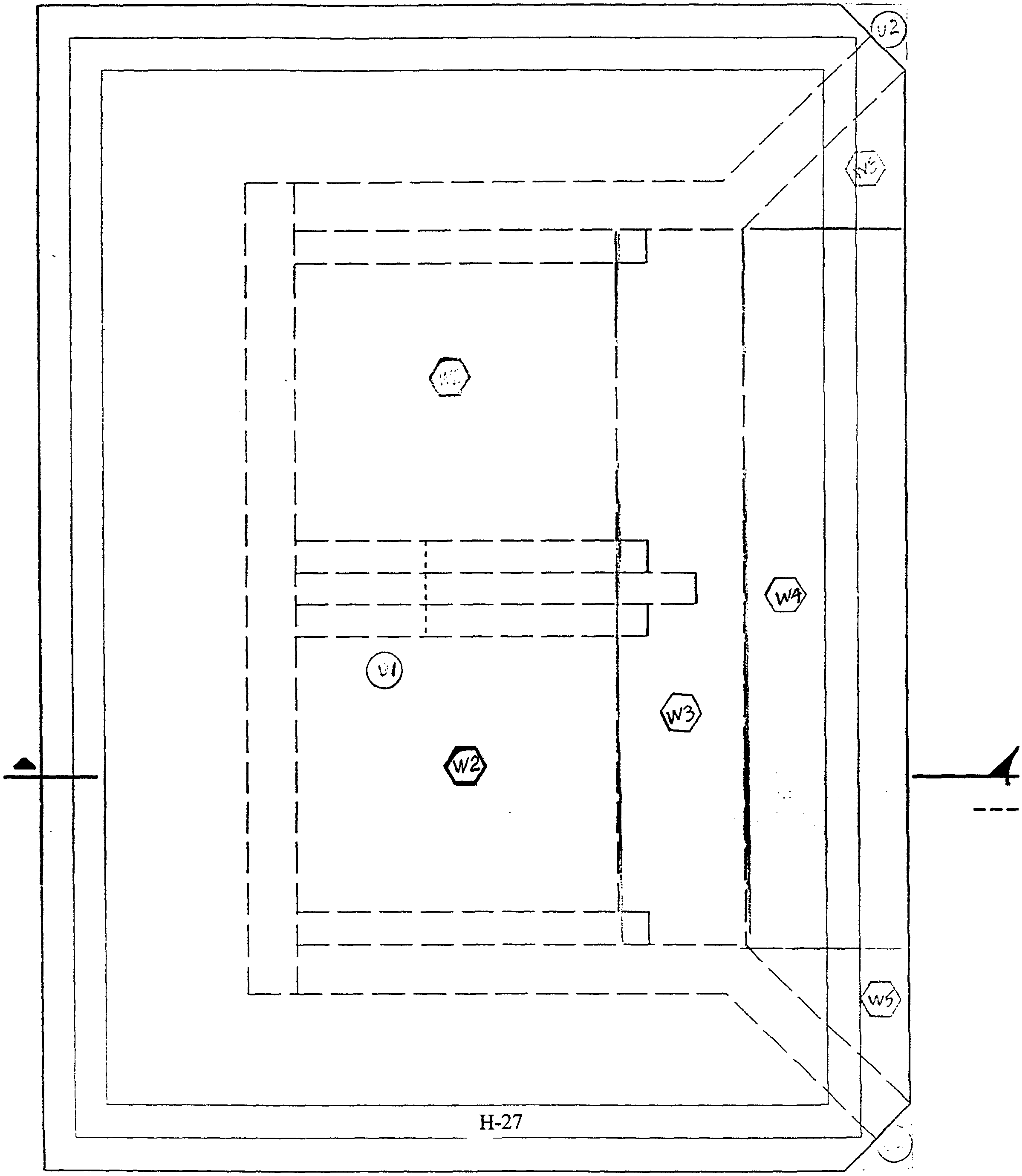
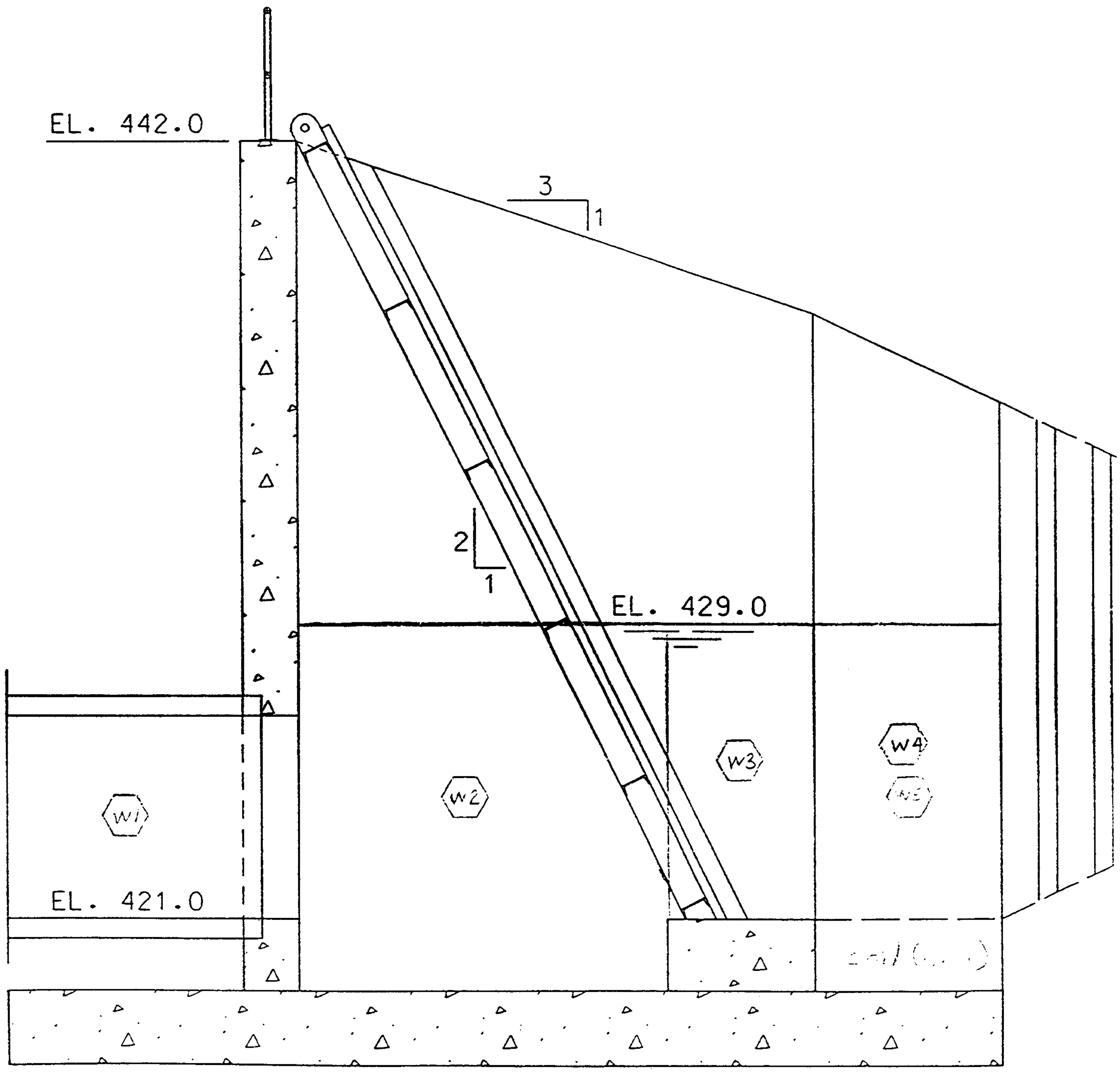
1 Aug 80



PLAN

INTAKE FROM 3-PUMP



Subject: Rice Lake - Intake Structure		Date: Dec 96
Computed by: C. Johnson	Checked by	Sheet of

Water Down

	Force (lbs)	Arm (ft)	Moment (ft-lbs)
W1 (2)*5.5²*π/4*8*62.5	23,758	4.0	95,033
W2 (2)*8.5*10*10*62.5	106,250	13.0	1,381,250
(4)*½*7*3.5*1*62.5	3,062	16.83	51,542
W3 4*22*8*62.5	44,000	20.0	880,000
−½*4.5*2.25*1*62.5	−316	18.75	−5,933
W4 22*5*10*62.5	68,750	24.5	165,438
W5 (2)*½*5*5*10*62.5	15,625	25.33	395,781
	261,129		2,966,111

Uplift

U1 36*27*12*62.5	729,000	13.5	−9,841,500
U2 −(2)*½*2*2*12*62.5	3,000	26.33	−78,990
	732,000 ↑		−9,920,490

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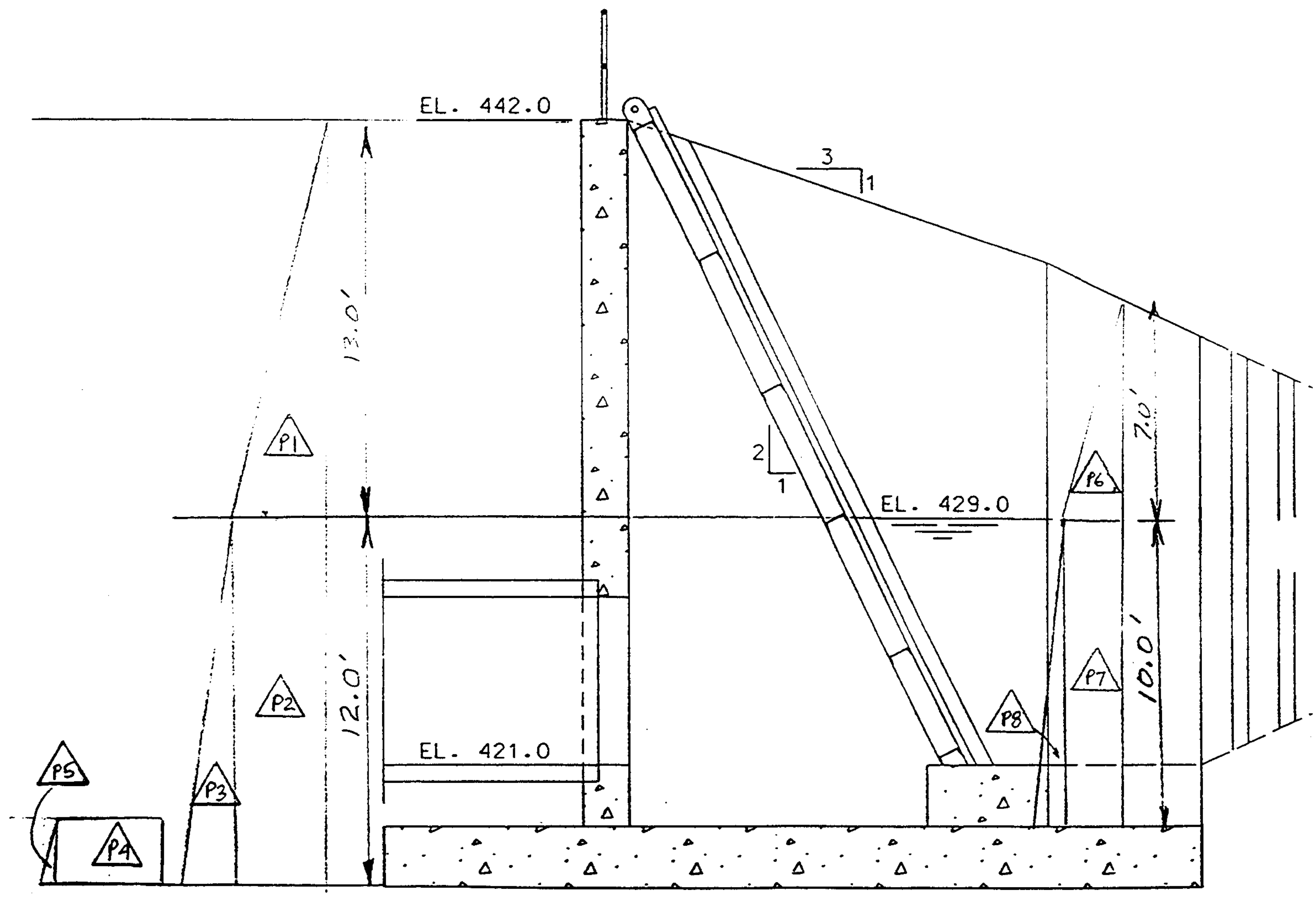
INTAKE FROM 3-PUMP



Subject: Rice Lake - Intake Structure		Date: Dec 96
Computed by: C. Johnson	Checked by	Sheet of

AT Rest Soil Pressure

	Force (lbs)	Arm (ft)	Moment (ft-lbs)
P1: $(25) * 1/2 * 13^2 * 0.5 * 125$	132,031	16.33	2,156,510
P2: $(25) * 12 * 13 * 0.5 * 125$	243,750	6.0	1,462,500
P3: $(25) * 1/2 * 12^2 * 0.5 * 125$	112,500	4.0	450,000
P4: $(36-25) * 2 * (13 * 0.5 * 125 + 10 * 0.5 * 62.5)$	24,750	1.0	24,750
P5: $(36-25) * 1/2 * 2^2 * 0.5 * 62.5$	1,375	0.67	921
P6: $(2 * 4.5) * 1/2 * 7^2 * 0.5 * 125$	13,781	14.33	197,485
P7: $(2 * 4.5) * 10 * 7 * 0.5 * 125$	39,375	7.0	275,625
P8: $(2 * 4.5) * 1/2 * 10^2 * 0.5 * 62.5$	14,062	5.33	74,953
	581,624		4,642,744

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Subject: Rice Lake - Intake Structure		Date: Dec 96
Computed by: C. Johnson	Checked by	Sheet of

	Vertical (lbs)	Horizontal (lbs)	Moment ft·lbs
Concrete	719,128		9,668,650
soil & Water Down	1,128,423		9,452,509
Water Down	261,129		2,966,110
Uplift	-732,000		-9,920,490
Soil Pressure		581,624	4,642,744
	1,376,680	581,624	16,809,523

$$\bar{X} = \frac{16,809,523}{1,376,680} = 12.21 \text{ ft}$$

Without uplift (for computer program) (with out soil pressure)

2,108,680 lbs   22,087,269

$$\bar{X} = \frac{22,087,269}{2,108,680} = 10.47'$$

$$\text{Load/ft} \ \frac{2,108,680}{36} = 58,574 \text{ lbs}$$

NCR Form 381b
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```
10010 TITL ILLINOIS RIVER - RICE LAKE EMP - PUMP INTAKE STRUCTURE
10020 STRU  4     .00010     417.00    1.00000
10030          .00     417.00
10040          .00     442.00
10050        27.00     442.00
10060        27.00     417.00
10070 SOLT  1  1      28.00     .00000     .12500     442.00
10080     -100.00     442.00
10090 SORT  1  1      28.00     .00000     .12500     417.00
10100       100.00     417.00
10110 SOST      28.00     .00000
10120 METH  1
10130 WATR     429.00     429.00     .06250        0.
10140 FACT        .50       1.50     1.0000
10150 VPLO      10.47    58.5740
10160 END
```

PROGRAM CSLIDE - ECHOPRINT

DATE: 97/01/14 TIME: 7.34.39

ILLINOIS RIVER - RICE LAKE EMP - PUMP INTAKE STRUCTURE

SINGLE FAILURE PLANE ANALYSIS

HYDROSTATIC WATER FORCE COMPUTED FOR WEDGES

NO OF CORNERS IN STRUCTURE ---------- 4
DENSITY OF CONCRETE ----------------- .0001(KCF)
DENSITY OF WATER -------------------- .0625(KCF)
WATER LEVEL LEFT SIDE --------------- 429.00(FT)
WATER LEVEL RIGHT SIDE -------------- 429.00(FT)
NO. OF SOIL LAYERS LEFT SIDE -------- 1
NO. OF SOIL LAYERS RIGHT SIDE ------- 1

ELEV. OF WEDGE-STRUCTURE INTERSECTION
ON ACTIVE SIDE OF STRUCTURE ---------417.000(FT)

STRUCTURE INFORMATION

POINT	X-COORD	Y-COORD
1	.00	417.00
2	.00	442.00
3	27.00	442.00
4	27.00	417.00

LEFTSIDE SOIL DATA

LAYER NO.	FRICTION ANGLE (DEG)	COHESION (KSF)	UNIT WEIGHT (KCF)	ELEV AT STRUCTURE (FT)
1	28.00	.0000	.125	442.00

LAYER NO	POINT NO. 1 X-COORD	Y-COORD
1	-100.00	442.00

SOIL DATA BELOW STRUCTURE

FRICTION ANGLE --------- 28.00
COHESION --------------- .0000

RIGHTSIDE SOIL DATA

LAYER NO.	FRICTION ANGLE (DEG)	COHESION (KSF)	UNIT WEIGHT (KCF)	ELEV AT STRUCTURE (FT)
1	28.00	.0000	.125	417.00

LAYER NO	POINT NO. 1 X-COORD	Y-COORD
1	100.00	417.00

VERTICAL POINT LOADS

X-COORDINATE (FT)	MAGNITUDE (KIPS)
10.47	58.574

PROGRAM CSLIDE - FINAL RESULTS

DATE: 97/01/14 TIME: 7.35.01

ILLINOIS RIVER - RICE LAKE EMP - PUMP INTAKE STRUCTURE

SINGLE FAILURE PLANE ANALYSIS

HYDROSTATIC WATER FORCE COMPUTED FOR WEDGES

WEDGE NUMBER	HORIZONTAL LOADS LEFT SIDE (KIPS)	RIGHT SIDE (KIPS)	VERTICAL LOAD (KIPS)
1	.000	.000	.000
2	.000	4.500	58.574
3	.000	.000	.000

WATER PRESSURES ON WEDGES

LEFTSIDE WEDGES

WEDGE NO.	TOP PRESSURE (KSF)	BOTTOM PRESSURE (KSF)
1	.000	.750

STRUCTURAL WEDGE

X-COORD. (FT) PRESSURE (KSF)

.00	.750
27.00	.750

RIGHTSIDE WEDGES

WEDGE NO.	TOP PRESSURE (KSF)	BOTTOM PRESSURE (KSF)
3	.000	.000

WEDGE NUMBER	FAILURE ANGLE (DEG)	TOTAL LENGTH (FT)	WEIGHT OF WEDGE (KIPS)	SUBMERGED LENGTH (FT)	UPLIFT FORCE (KIPS)
1	-56.086	30.125	26.262	14.460	5.422
2	.000	27.000	.067	27.000	20.250
3	.000	.000	.000	.000	.000

WEDGE NUMBER	NET FORCE ON WEDGE (KIPS)
1	-20.133
2	20.133
3	.000

SUM OF FORCES ON SYSTEM ---- .000

FACTOR OF SAFETY ----------- 1.306

Subject Rice Lake EMP - Intake Structure		Date Jan 97
Computed by chJ	Checked by	Sheet of

Assume failure plane 5 feet below concrete
Elevation 412.0

<u>Add soil weight</u>

	Force (lbs)	arm (ft)	Moment (ft-lbs)
27*5*125	16,875	13.5	227,812
structure	58,574	10.474453	613,531
	75,449 lbs		841,343

$$\bar{X} = \frac{841,343}{75,449} = \underline{\underline{11.15\ ft}}$$

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```
10010 TITL_ILLINOIS RIVER - RICE LAKE EMP - PUMP INTAKE STRUCTURE
10020 STRU 4     .00010     417.00     1.00000
10030          .00     412.00
10040          .00     442.00
10050       27.00     442.00
10060       27.00     412.00
10070 SOLT  1  1     28.00     .00000     .12500     442.00
10080     -100.00     442.00
10090 SORT  1  1     28.00     .00000     .12500     417.00
10100      100.00     417.00
10110 SOST     28.00     .00000
10120 METH  1
10130 WATR     429.00     429.00     .0625     0.
10140 FACT     .50     1.50     1.0000
10150 VPLO     11.15     75.449
10160 END
```

PROGRAM CSLIDE - ECHOPRINT

DATE: 97/01/17 TIME: 11.33.52

ILLINOIS RIVER - RICE LAKE EMP - PUMP INTAKE STRUCTURE

SINGLE FAILURE PLANE ANALYSIS

HYDROSTATIC WATER FORCE COMPUTED FOR WEDGES

NO OF CORNERS IN STRUCTURE ---------- 4
DENSITY OF CONCRETE ----------------- .0001(KCF)
DENSITY OF WATER -------------------- .0625(KCF)
WATER LEVEL LEFT SIDE --------------- 429.00(FT)
WATER LEVEL RIGHT SIDE -------------- 429.00(FT)
NO. OF SOIL LAYERS LEFT SIDE -------- 1
NO. OF SOIL LAYERS RIGHT SIDE ------- 1

ELEV. OF WEDGE-STRUCTURE INTERSECTION
ON ACTIVE SIDE OF STRUCTURE ---------417.000(FT)

STRUCTURE INFORMATION

POINT	X-COORD	Y-COORD
1	.00	412.00
2	.00	442.00
3	27.00	442.00
4	27.00	412.00

LEFTSIDE SOIL DATA

LAYER NO.	FRICTION ANGLE (DEG)	COHESION (KSF)	UNIT WEIGHT (KCF)	ELEV AT STRUCTURE (FT)
1	28.00	.0000	.125	442.00

LAYER NO	POINT NO. 1 X-COORD	Y-COORD
1	-100.00	442.00

SOIL DATA BELOW STRUCTURE

FRICTION ANGLE --------- 28.00
COHESION --------------- .0000

RIGHTSIDE SOIL DATA

LAYER NO.	FRICTION ANGLE (DEG)	COHESION (KSF)	UNIT WEIGHT (KCF)	ELEV AT STRUCTURE (FT)
1	28.00	.0000	.125	417.00

LAYER NO	POINT NO. 1 X-COORD	Y-COORD
1	100.00	417.00

VERTICAL POINT LOADS

X-COORDINATE (FT)	MAGNITUDE (KIPS)
11.15	75.449

PROGRAM CSLIDE - FINAL RESULTS

DATE: 97/01/17 TIME: 11.34.12

ILLINOIS RIVER - RICE LAKE EMP - PUMP INTAKE STRUCTURE

SINGLE FAILURE PLANE ANALYSIS

HYDROSTATIC WATER FORCE COMPUTED FOR WEDGES

WEDGE NUMBER	HORIZONTAL LOADS LEFT SIDE (KIPS)	RIGHT SIDE (KIPS)	VERTICAL LOAD (KIPS)
1	.000	.000	.000
2	.000	4.500	75.449
3	.000	.000	4.971

WATER PRESSURES ON WEDGES

LEFTSIDE WEDGES

WEDGE NO.	TOP PRESSURE (KSF)	BOTTOM PRESSURE (KSF)
1	.000	.750

STRUCTURAL WEDGE

X-COORD. (FT) PRESSURE (KSF)

.00	1.063
27.00	1.063

RIGHTSIDE WEDGES

WEDGE NO.	TOP PRESSURE (KSF)	BOTTOM PRESSURE (KSF)
3	.750	1.063

WEDGE NUMBER	FAILURE ANGLE (DEG)	TOTAL LENGTH (FT)	WEIGHT OF WEDGE (KIPS)	SUBMERGED LENGTH (FT)	UPLIFT FORCE (KIPS)
1	-53.070	31.274	29.361	15.012	5.629
2	.000	27.000	.081	27.000	28.688
3	37.029	8.303	2.071	8.303	7.524

WEDGE NUMBER	NET FORCE ON WEDGE (KIPS)
1	-24.002
2	18.086
3	5.916

SUM OF FORCES ON SYSTEM ---- .000

FACTOR OF SAFETY ----------- 1.833

Subject: Rice Lake EMP - Intake Structure	Date: Jan 97
Computed by: chJ	Checked by:	Sheet of

Assume failure plane 10 feet below concrete Elevation 407.0

Add soil weight

	Force (lbs)	arm (ft)	Moment (ft-lbs)
27 * 10 * 125	33,750	13.5	455,625
Structure	58,449	10.474453	613,531
	92,324 lbs		1,069,156

$$\bar{X} = \frac{1,069,156}{92,324} = \underline{\underline{11.58\ ft}}$$

NCR Form 381b
1 Aug 80

```
10010 TITL ILLINOIS RIVER - RICE LAKE EMP - PUMP INTAKE STRUCTURE
10020 STRU 4     .00010     417.00    1.00000
10030        .00    407.00
10040        .00    442.00
10050      27.00    442.00
10060      27.00    407.00
10070 SOLT  1  1     28.00     .00000     .12500     442.00
10080    -100.00    442.00
10090 SORT  1  1     28.00     .00000     .12500     417.00
10100     100.00    417.00
10110 SOST     28.00     .00000
10120 METH  1
10130 WATR     429.00     429.00     .0625       0.
10140 FACT       .50      1.50    1.0000
10150 VPLO     11.58      92.324
10160 END
```

PROGRAM CSLIDE - ECHOPRINT

DATE: 97/01/20 TIME: 8.52.52

ILLINOIS RIVER - RICE LAKE EMP - PUMP INTAKE STRUCTURE

SINGLE FAILURE PLANE ANALYSIS

HYDROSTATIC WATER FORCE COMPUTED FOR WEDGES

NO OF CORNERS IN STRUCTURE ---------- 4
DENSITY OF CONCRETE ----------------- .0001(KCF)
DENSITY OF WATER -------------------- .0625(KCF)
WATER LEVEL LEFT SIDE --------------- 429.00(FT)
WATER LEVEL RIGHT SIDE -------------- 429.00(FT)
NO. OF SOIL LAYERS LEFT SIDE -------- 1
NO. OF SOIL LAYERS RIGHT SIDE ------- 1

ELEV. OF WEDGE-STRUCTURE INTERSECTION
ON ACTIVE SIDE OF STRUCTURE ---------417.000(FT)

STRUCTURE INFORMATION

POINT	X-COORD	Y-COORD
1	.00	407.00
2	.00	442.00
3	27.00	442.00
4	27.00	407.00

LEFTSIDE SOIL DATA

LAYER NO.	FRICTION ANGLE (DEG)	COHESION (KSF)	UNIT WEIGHT (KCF)	ELEV AT STRUCTURE (FT)
1	28.00	.0000	.125	442.00

LAYER NO	POINT NO. 1 X-COORD	Y-COORD
1	-100.00	442.00

SOIL DATA BELOW STRUCTURE

FRICTION ANGLE --------- 28.00
COHESION --------------- .0000

RIGHTSIDE SOIL DATA

LAYER NO.	FRICTION ANGLE (DEG)	COHESION (KSF)	UNIT WEIGHT (KCF)	ELEV AT STRUCTURE (FT)
1	28.00	.0000	.125	417.00

LAYER NO	POINT NO. 1 X-COORD	Y-COORD
1	100.00	417.00

VERTICAL POINT LOADS

X-COORDINATE (FT)	MAGNITUDE (KIPS)
11.58	92.324

PROGRAM CSLIDE - FINAL RESULTS

DATE: 97/01/20 TIME: 8.53.42

ILLINOIS RIVER - RICE LAKE EMP - PUMP INTAKE STRUCTURE

SINGLE FAILURE PLANE ANALYSIS

HYDROSTATIC WATER FORCE COMPUTED FOR WEDGES

WEDGE NUMBER	HORIZONTAL LOADS LEFT SIDE (KIPS)	RIGHT SIDE (KIPS)	VERTICAL LOAD (KIPS)
1	.000	.000	.000
2	.000	4.500	92.324
3	.000	.000	8.912

WATER PRESSURES ON WEDGES

LEFTSIDE WEDGES

WEDGE NO.	TOP PRESSURE (KSF)	BOTTOM PRESSURE (KSF)
1	.000	.750

STRUCTURAL WEDGE

X-COORD. (FT) PRESSURE (KSF)

.00	1.375
27.00	1.375

RIGHTSIDE WEDGES

WEDGE NO.	TOP PRESSURE (KSF)	BOTTOM PRESSURE (KSF)
3	.750	1.375

WEDGE NUMBER	FAILURE ANGLE (DEG)	TOTAL LENGTH (FT)	WEIGHT OF WEDGE (KIPS)	SUBMERGED LENGTH (FT)	UPLIFT FORCE (KIPS)
1	-49.901	32.683	32.893	15.688	5.883
2	.000	27.000	.094	27.000	37.125
3	40.082	15.531	7.427	15.531	16.502

WEDGE NUMBER	NET FORCE ON WEDGE (KIPS)
1	-29.040
2	14.014
3	15.026

SUM OF FORCES ON SYSTEM ---- .000

FACTOR OF SAFETY ----------- 3.090

Subject		Date
Rice Lake EMP – Intake Structure		Jan 97
Computed by chJ	Checked by	Sheet of

<u>Failure Plane</u>	Sliding F.S.
at base of concrete (EL 417.0)	1.306
5′ below concrete (EL 412.0)	1.833
10′ below concrete (EL 407.0)	3.090

The ≡ piling is stiff and there is two rows of it. Also the two lateral row on each side will probably force the failure plane to be near the bottom of the sheet piling.

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1 Aug 80

MECHANICAL/ELECTRICAL

A

P

P

E

N

D

I

X

I

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17D)

RICE LAKE STATE FISH AND WILDLIFE AREA
HABITAT REHABILITATION AND ENHANCEMENT

LA GRANGE POOL, ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

APPENDIX I
MECHANICAL AND ELECTRICAL CONSIDERATIONS

PURPOSE AND SCOPE

The purpose of this appendix is to present a preliminary design for the new pumping station at Rice Lake State Fish and Wildlife Area. EM 1110-2-3105 entitled "Mechanical and Electrical Design of Pumping Stations" and pump manufacturers' engineering information were used to develop the design and layout presented in this appendix. The layout was based on efficient operation of the station and ease of normal maintenance.

GENERAL

A new pump station housing the three submersible propeller-type pumps is proposed for the Rice Lake project. A station containing two pumps also was evaluated. The three pump options will provide lower operating costs.

The functions of the new pump station will be to discharge river water into the protected Big and Rice Lakes during waterfowl migration seasons for the purposes of creating a maintained flooded marsh and for drawing down the lakes during river stages too high for gravity drainage. The pump station also will allow gravity flow from the refuge to the river during low river stages.

The pumping station will be located near the abandoned Copperas Creek Lock at river mile 137. The pump station will be constructed integral with the levee landward toe section and will draw water from the river through twin corrugated metal pipes which are approximately 400 feet long.

STATION FEATURES

The pumps will provide approximately 100,000 total gpm and are sized to fill Rice and Big Lakes to the normal water elevation of 436.0 in 14 days. A hand cleanable trashrack will be provided at each intake entrance to protect the pump propellers from large debris.

The pump station structure will consist of a two-level, reinforced concrete structure and sump. Sluice gates will be installed at each level on both the river side and the lake side of the pump station. The opening configuration of the sluice gates will determine if pump discharge direction is to the lakes or to the river. System head computations and pump curves are shown on plates I-1 through I-7.

OPERATION

The pump unit will be manually activated and in the automatic mode, and will be shut off by float switches when the wildlife management area reaches elevation 434.0. In addition, a provision for complete manual operation will allow for manual shutoff when pumping is supervised.

ELECTRICAL

Each pump unit will be operated by a directly attached electric motor. Power will be provided by a 12.5 kV power line owned and maintained by Central Illinois Public Service Company (CIPS).

The 12.5 kV power line will be transformed down to 480V to run the three approximately 215 HP pumps.

The electrical analysis is shown on plates I-8 through I-38. Three topics are covered in the electrical calculations: (1) the choices of utility payments, (2) the sizing of the conductors, and (3) the size and cost of the motor control centers.

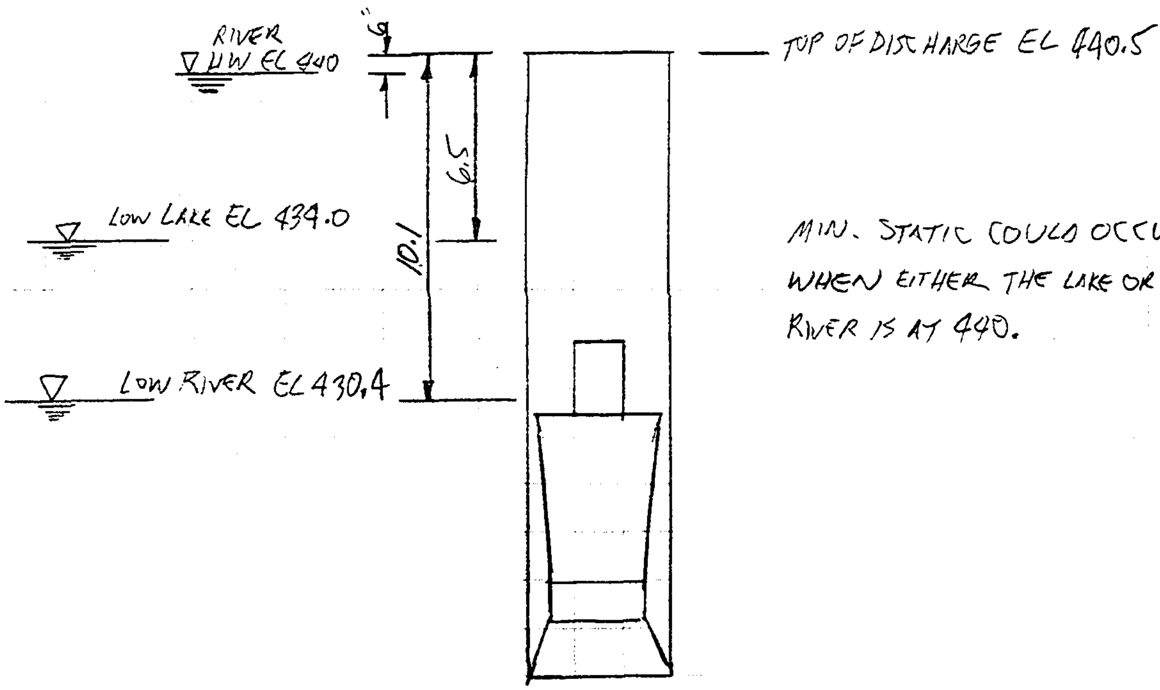
The choices of utility payments compare several billing scenarios for a pump station containing two approximately 525 HP pumps and one containing the three 215 HP pumps. Running the three 215 HP pumps using Time-of-Day metering, pumping only during off-peak times, is the least expensive billing scenario. A timer may be considered to control the hours at which the pumps will operate so they can be programmed to run automatically during off-peak hours only.

Conductor sizes were calculated for the 525 HP pumps and the 215 HP pumps for both the incoming power to the pump station and feeder conductors from the controller to each pump. Each size of pump requires relatively large conductor and conduit sizes. It becomes more cost effective to utilize smaller parallel conductors. Several options are listed, and the most economical size and number of conductors were selected as shown on plates 14 and 15 of the main report.

The size and costs of the motor control centers (MCC) were based on information from Square-D and Allen-Bradley. Due to the large size of the motors and pumps, reduced voltage starting or soft starting will be provided. The information in this report includes price estimates and MCC component arrangements for outdoor use (NEMA 3R rating minimum) and indoor use (NEMA 12 rating). If the MCC is mounted inside a building, the components can be separated and positioned at convenient locations around the inside of the building. The storage spaces can be eliminated. An added advantage of locating the MCC inside is a building is that the MCC and pumps are better protected from vandalism.

Subject Rice Lake DPR Pumps		Date 10/96
Computed by	Checked by	Sheet 1 of

STATIC HEAD DIAGRAM



MIN. STATIC COULD OCCUR WHEN EITHER THE LAKE OR THE RIVER IS AT 440.

PUMPING FACILITY MUST BE ABLE TO PUMP FROM RIVER TO LAKE AND VICE VERSA

MAX. STATIC = 10.1 ft

MIN. STATIC = 440.5 - 440 = 0.5 ft

CALCULATE RIVER INTAKE LOSSES - TWO PUMPS @ 50,000 GPM EA

TWIN 66 INCH DIA. CMP BOTH PIPES FLOWING FULL FROM RIVER

$L \simeq 400$ ft

$Q = 100{,}000$ GPM OR $50{,}000$ GPM PER PUMP $= 111.4$ CFS

USE MANNING EQUATION

$$S = h_f = \left(\frac{Vn}{1.486\, r^{2/3}}\right)^2$$

n = COEFFICIENT OF ROUGHNESS = 0.012 FROM CONTECH CATALOG FOR LINED CORRUGATED METAL PIPE

r = HYDRAULIC RADIUS = $D/4$

$$V = \left(111.4\ \frac{ft^3}{s}\right)\left(\frac{4}{\pi (5.5)^2}\right) = 4.69\ ft/s$$

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Subject RICE LAKE DPR PUMPS		Date 10/96
Computed by	Checked by	Sheet 2 of

$$h_f = \left(\frac{(4.69)(0.012)}{1.486\,(1.375)^{2/3}}\right)^2$$

$h_f = 0.00094$ ft/ft × 400 ft

$h_f = 0.376$ ft

FROM EM 1110-2-3105, ASSUME TRASHRACK LOSSES AS 0.5 ft

FROM RODNEY HUNT SLUICE GATE MANUAL

THE FOLLOWING APPLIES:

$$Q = C_d A \sqrt{2 g H_L}$$

WHERE Q = FLOW (cfs)

C_d = DISCHARGE COEFFICIENT USE 0.70 SUBMERGED FLOW

A = AREA ft² (5.5×5.5)

g = GRAVITY (32.2 ft/s²)

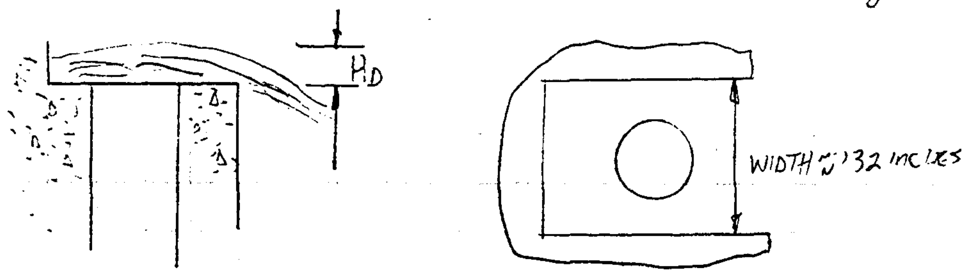
H_L = DIFFERENTIAL HEAD

$$111.4 \text{ cfs} = (0.7)(30.25\ \text{ft}^2)\sqrt{2(32.2)H_L}$$

$H_L = 0.429$ ft

Subject: RICE LAKE DPR PUMPS		Date: 10/96
Computed by	Checked by	Sheet 3 of

FROM FLYGT DESIGN RECOMMENDATION FOR PUMPING STATIONS WITH LARGE SUBMERSIBLE PROPELLER PUMPS Pg 16



FOR Q = 50,000 GPM

$H_D \approx 2.3$ ft

TOTAL SYSTEM LOSSES = $H_{STATIC} + H_{INTAKE} + H_{TRASH} + H_{GATE} + H_{DISCHARGE}$

$H_{TDH_{MAX}} = 10.1 + 0.376 + 0.5 + 0.424 + 2.3$

$H_{TDH_{MAX}} = \underline{13.71 \text{ ft}}$

$H_{TDH_{MIN}} = .5 + 0.376 + 0.5 + 0.429 + 2.3$

$H_{TDH_{MIN}} = \underline{4.11 \text{ ft}}$

SELECT FLYGT PL-7140-355 SUBMERSIBLE PROPELLER PUMP
11° PROP ANGE 514 HP
Q = 55,000 GPM AT 13.9 TDH 82% EFF
$NPSH_R$ = 23 ft MIN. SUBMERGENCE 5.8 ft
64" DIA TUBE

Subject: RICE-LAKE DPR PUMPS		Date 10/6
Computed by	Checked by	Sheet 4 of

ALTERNATIVE OF THREE PUMPS AT 33,000 GPM EACH

33,000 ⇒ 73.5 CFS

USING MANNING EQUATION

$$h_f = \left(\frac{3.1(.012)}{1.486(1.375)^{2/3}}\right)^2$$

$$h_L = 0.163 \text{ ft}$$

$$h_{TRASHRACK} = 0.5 \text{ ft}$$

GATE LOSSES

$$73.5 \text{ CFS} = (0.70)\, 36 \text{ft}^2 \sqrt{2(32.2) H_L}$$

$$H_L = 0.132 \text{ ft}$$

EXIT LOSS FOR Q = 33,000 FROM FLYGT MANUAL

$$H_D \approx 2.0 \text{ ft}$$

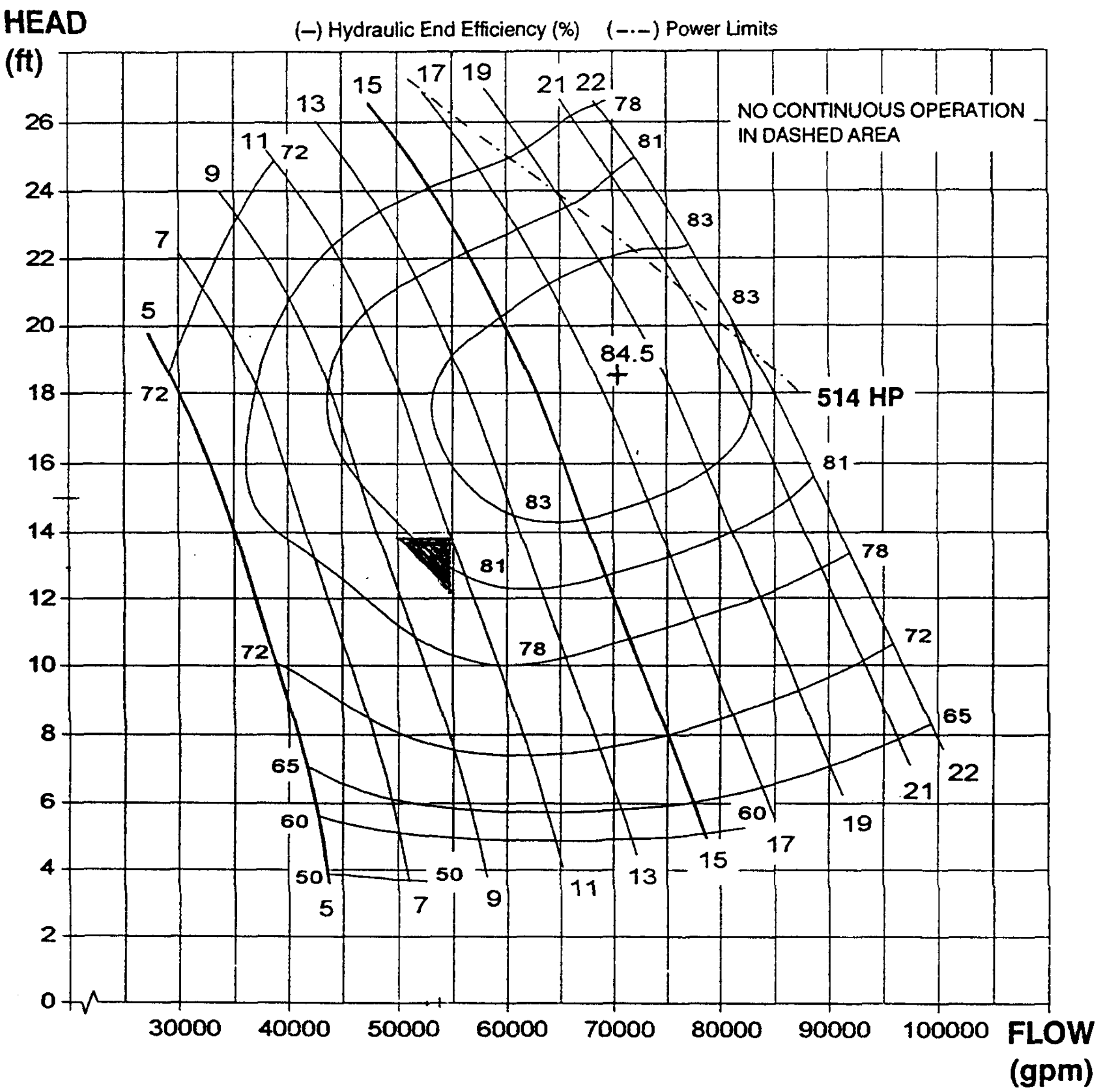
$$H_{TDH_{MAX}} = 10.1 + 0.163 + 0.5 + 0.132 + 2.0$$

$$H_{TDH_{MAX}} = \underline{12.896 \text{ ft}}$$

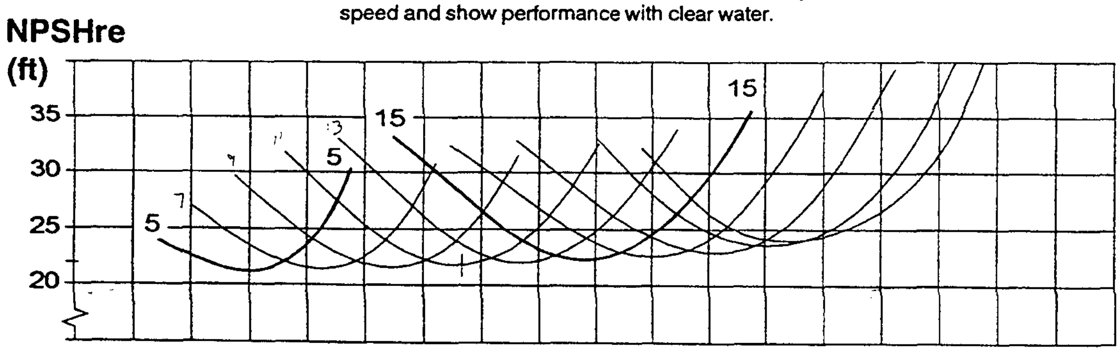
$$H_{TDH_{MIN}} = \underline{3.296 \text{ ft}}$$

SELECT FLYGT PL 7101-590 SUBMERSIBLE PUMP
14° PROP ANGLE 215 HP
Q = 34,000 GPM @ 13.0 TDH 81.5% EFF
$NPSH_R$ = 18 ft MIN. SUBMERGENCE = 4.8 ft
48" DIA TUBE

FREQ.	CONFIG.		SECTION	PAGE
60 HZ	PL	**PL-7140-355**	4	1
PHASE	BLADES	**Performance Field**	SUPERSEDES	ISSUED
3	B4			10/94

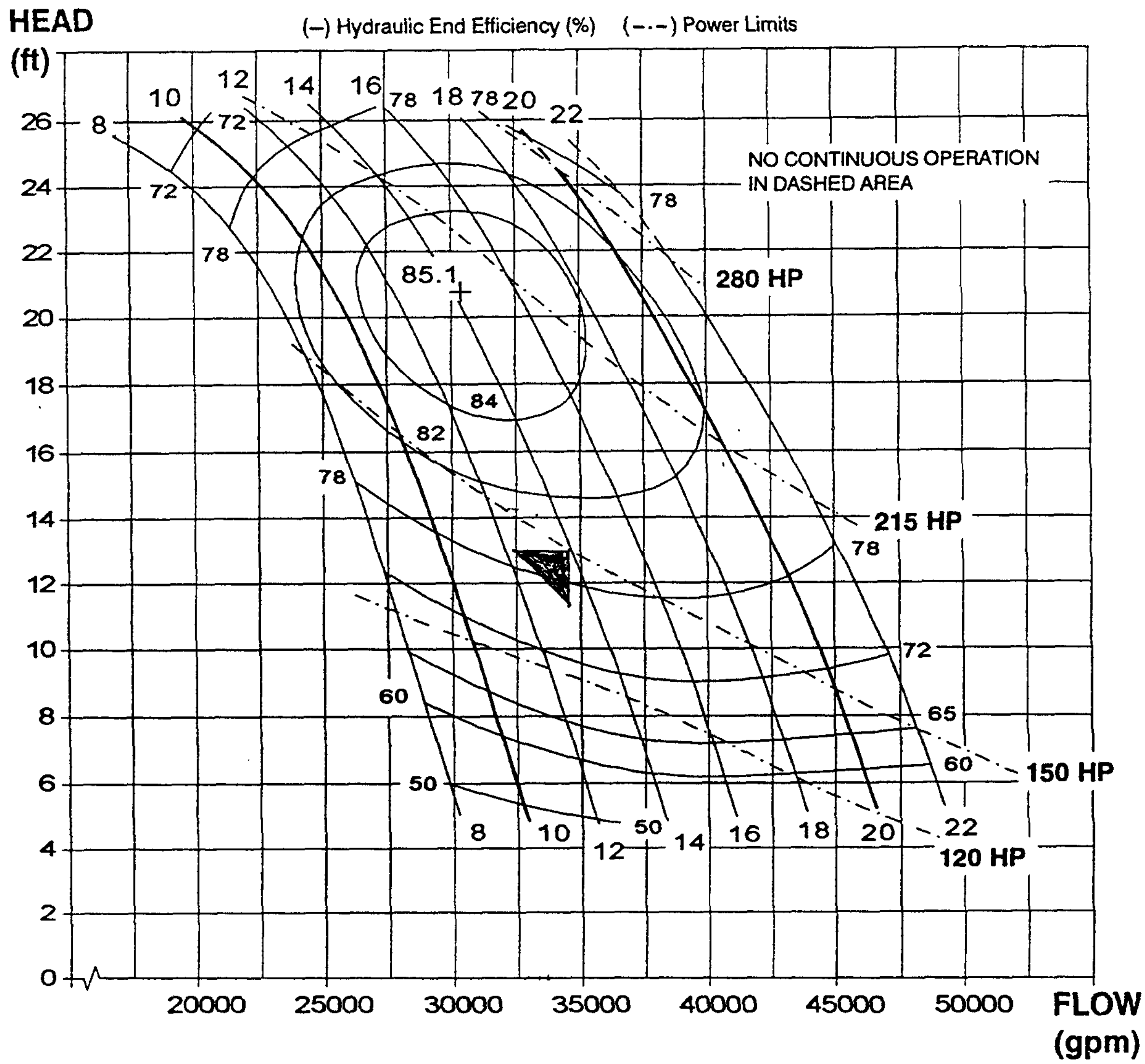


NOTE: Curves are based on nominal constant hydraulic-end speed and show performance with clear water.

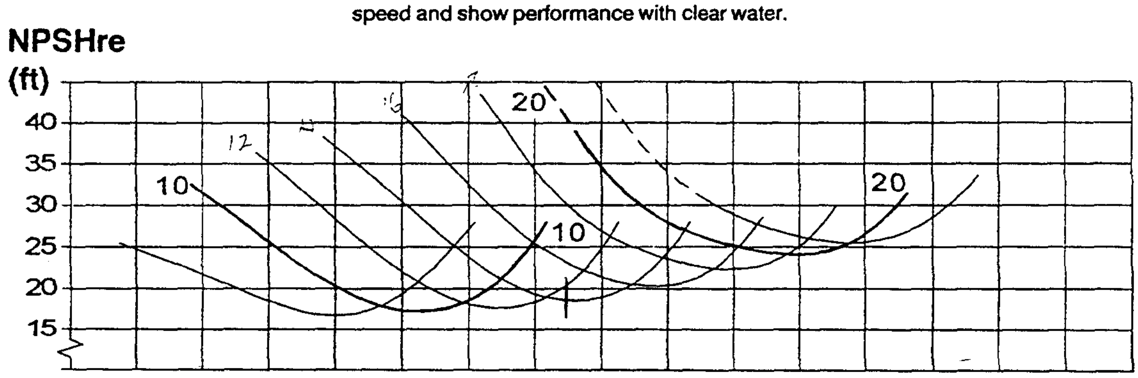


FLYGT

PAGE	SECTION		CONFIG.	FREQ.
2	4	**PL-7101-590**	PL	60 HZ
ISSUED	SUPERSEDES	**Performance Field**	BLADES	PHASE
10/94			B4	3



NOTE: Curves are based on nominal constant hydraulic-end speed and show performance with clear water.



Rice Lake Pump Requirements

Rice Lake Submersible Pumps - open discharge									
- @ River EL 429.0; HW @ EL. 440.0; Low Lake EL. 434.0									
Top of Discharge Tube @ EL 440.5									
Twin 66" RCP intakes ~400 ft long									
GPM	Intake Dia. ft	Intake V ft/s	HL Intake 1/	Gate Size ft	HL Sluice Gate 2/	HL Discharge 3/	Trsh rck Add .5'	Min Total HD (.5st)	Max Total HD (11.5st)
50000	5.5	4.689	0.375	5.500	0.430	2.3	0.5	4.105	13.705
33000	5.5	3.095	0.163	6.000	0.132	2.0	0.5	3.296	12.896

1/ Manning Equation n=0.012

2/ From Rodney Hunt Q=Cd*A*SQRT(2gHL) Cd=0.7

3/ From Flygt Design Recommendations for Pump Stations with Large Submersible Pumps

RICE LAKE ELECTRICAL POWER CALCULATIONS

The following are sample calculations for electrical charges for this pump station. These sample calculations, called Rate Structures, incorporate the following variables:

a) Two 525 HP pumps Vs three 215 HP pumps.
b) CIPS rates 9T, 2B, and Rider 13.
c) Summer Vs winter rates.
d) On-peak Vs Off-peak run time.
e) 20 day fall run and a 10 day spring/summer run scenario.

Our design constraint was to pump 100,000 GPM. This lead to a choice of two 525 HP or three 215 HP pumps.

CIPS offers the 9T and 2B rates and Rider 13. Under 9T and 2B, there is the choice of summer Vs winter rates. The summer billing months are June, July, August, and September. The winter months are all the others. Rate 9T also offers On-peak and Off-peak rates. Rider 13 is an economic development rider which can be applied to either rate 9T or 2B which allows the billing demand charge to be cut by 50% for 5 years.

The plan is to run the pumps approximately 20 days in the fall to maintain the proper water levels. An additional run period may be needed in the spring or summer for approximately 10 days.

On-peak rates are 10AM to 10PM Monday through Friday. Off-peak rates are 10PM to 10AM Monday through Friday, all day Saturday, Sunday, and holidays. All calculations were done using the year 2001 as the sample year. The month and days used are specified in each Rate Structure. Holidays and weekends were taken as they fell on the days of operation for the year 2001. No attempt was made shift the operating schedule to optimize or minimize weekends and holidays. Hence, the On-peak Vs Off-peak operating times could vary by a day or two from year to year, and as the operator shifts the operation schedule from the dates specified in the Rate Structures. The trend of how one rate compare to another will still remain the same.

The Fuel Adjustment Clause (FAC), Demand-Side Adjustment Clause (DSAC), and Electrical Environmental Adjustment Charge (EEAC) are variables which I listed as an additive number called X. CIPS claims that the DSAC and EEAC are around $ 0. If the FAC cost is around $ .010 to $ .015 per KWH, then the FAC for 480 hours of pumping with two 525 HP motors will be 393,600 KWH times $ .010 to $ .015 per KWH which equals $ 3936.60 to $ 5904.00. The FAC for 480 hours of pumping with three 215 HP motors will be 247,680 KWH times $ .010 to $ .015 per KWH which equals $ 2476.80 to $ 3715.20.

CIPS says that the Rice Lake pump station is exempt from Federal taxes. Interstate Commerce Commission (ICC) taxes are based on a rate of 0.1% of the Subtotal of the bill. The State taxes are based Power Consumption in KWH times .0032 or the Subtotal times .05, which ever is the smaller of the 2 numbers. Note the taxes should include the number X represents, but since X can not be calculated, I ignored including this value in the calculations. One can still get a feel for how the power bills are calculated and an order of magnitude of the numbers.

All prices used in the following calculations are Fall 1996 prices.

As of 1996, CIPS is willing to supply and connect up the transformers and supply a neutral to the pump station free of charge. This can change at any future time if we do not enter into an agreement to lock it in.

RATE STRUCTURE #1-TWO 525 HP PUMPS RUNNING IN FALL

RATE: 9T SUMMER
PERIOD: ON/OFF PEAK
TOTAL RUN TIME: SEP. 1-20, 2001 = 20 DAYS = 480 HRS
ON-PEAK RUN TIME: 13 HALF DAYS = 156 HRS
OFF-PEAK RUN TIME: 7 FULL DAYS + 13 HALF DAYS = 324 HRS
KWH FOR 20 DAYS: (480 HRS) x (410 KW) x 2 = 393,600 KWH

CHARGES

ON-PEAK = (156 HRS) x (410 KW) x 2 → (127,920 KWH) x ($ .0398/KWH) =	$ 5091.22
OFF-PEAK = (324 HRS) x (410 KW) x 2 → (265,680 KWH) x ($ .0105/KWH) =	$ 2789.64
ON-PEAK DEMAND = (410 KW) x 2 x ($ 13.20/KW) =	$ 10,824.00
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 18,731.81
FEDERAL TAX =	$ 0
ICC TAX = ($ 18,731.81) x (.001) =	$ 18.73
STATE TAX = ($ 18,731.81) x (.05) =	$ 936.59
FUEL ADJUSTMENT CLAUSE **DEMAND-SIDE ADJUSTMENT CLAUSE** **ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE**	$ X
TOTAL =	$ 19,687.13 + X

RATE STRUCTURE #2-TWO 525 HP PUMPS RUNNING IN FALL

RATE: 9T SUMMER
PERIOD: OFF PEAK
TOTAL RUN TIME: SEP. 1-30, 2001 = 29 1/2 DAYS = 480 HRS
ON-PEAK RUN TIME: 0
OFF-PEAK RUN TIME: 10 FULL DAYS + 20 HALF DAYS = 480 HRS
KWH FOR 29 1/2 DAYS: (480 HRS) x (410 KW) x 2 = 393,600 KWH

CHARGES

ON-PEAK =	$ 0
OFF-PEAK = (393,600 KWH) x ($ .0105/KWH) =	$ 4132.80
ON-PEAK DEMAND = (10 KW) x ($ 13.20/KW) =	$ 132.00
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 4291.75
FEDERAL TAX =	$ 0
ICC TAX = ($ 4291.75) x (.001) =	$ 4.29
STATE TAX = ($ 4291.75) x (.05) =	$ 214.59
FUEL ADJUSTMENT CLAUSE **DEMAND-SIDE ADJUSTMENT CLAUSE** **ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE**	$ X
TOTAL =	$ 4510.63 + X

RATE STRUCTURE #3-TWO 525 HP PUMPS RUNNING IN FALL

RATE: 9T WINTER
PERIOD: ON/OFF PEAK
TOTAL RUN TIME: OCT. 1-20, 2001 = 20 DAYS = 480 HRS
ON-PEAK RUN TIME: 15 HALF DAYS = 180 HRS
OFF-PEAK RUN TIME: 5 FULL DAYS + 15 HALF DAYS = 300 HRS
KWH FOR 20 DAYS: (480 HRS) x (410 KW) x 2 = 393,600 KWH

CHARGES

ON-PEAK = (180 HRS) x (410 KW) x 2 → (147,600 KWH) x ($ .0199/KWH) =	$ 2937.24
OFF-PEAK = (300 HRS) x (410 KW) x 2 → (246,000 KWH) x ($ .0105/KWH) =	$ 2583.00
ON-PEAK DEMAND = (410 KW) x 2 x ($ 10.71/KW) =	$ 8782.20
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 14,329.39
FEDERAL TAX =	$ 0
ICC TAX = ($ 14,329.39) x (.001) =	$ 14.33
STATE TAX = ($ 14,329.39) x (.05) =	$ 716.47
FUEL ADJUSTMENT CLAUSE **DEMAND-SIDE ADJUSTMENT CLAUSE** **ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE**	$ X
TOTAL =	$ 15,060.19 + X

RATE STRUCTURE #4-TWO 525 HP PUMPS RUNNING IN FALL

RATE: 9T WINTER
PERIOD: OFF PEAK
TOTAL RUN TIME: OCT. 1-NOV. 1, 2001 = 31 1/2 DAYS = 480 HRS
ON-PEAK RUN TIME: 0
OFF-PEAK RUN TIME: 8 FULL DAYS + 24 HALF DAYS = 480 HRS
KWH FOR 31 1/2 DAYS: (480 HRS) x (410 KW) x 2 = 393,600 KWH

CHARGES

ON-PEAK =	$ 0
OFF-PEAK = (393,600 KWH) x ($ .0105/KWH) =	$ 4132.80
ON-PEAK DEMAND = (10 KW) x ($ 10.71/KW) =	$ 107.10
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 4266.85
FEDERAL TAX =	$ 0
ICC TAX = ($ 4266.85) x (.001) =	$ 4.27
STATE TAX = ($ 4266.85) x (.05) =	$ 213.34
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 4484.46 + X

RATE STRUCTURE #5-TWO 525 HP PUMPS RUNNING IN FALL

RATE: 2B SUMMER
PERIOD: N/A
TOTAL RUN TIME: SEP. 1-20, 2001 = 20 DAYS = 480 HRS
ON-PEAK RUN TIME: N/A
OFF-PEAK RUN TIME: N/A
KWH FOR 20 DAYS: (480 HRS) x (410 KW) x 2 = 393,600 KWH

CHARGES

KWH CHARGE = (393,600 KWH) x ($ .0880/KWH) =	$ 34,636.80
CUSTOMER CHARGE =	$ 11.60
SUBTOTAL =	$ 34,648.40
FEDERAL TAX =	$ 0
ICC TAX = ($ 34,648.40) x (.001) =	$ 34.65
STATE TAX = (393,600 KWH) x ($.0032/KWH) =	$ 1259.52
FUEL ADJUSTMENT CLAUSE **DEMAND-SIDE ADJUSTMENT CLAUSE** **ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE**	$ X
TOTAL =	$ 35,942.57 + X

RATE STRUCTURE #6-TWO 525 HP PUMPS RUNNING IN FALL

RATE: 2B WINTER
PERIOD: N/A
TOTAL RUN TIME: OCT. 1-20, 2001 = 20 DAYS = 480 HRS
ON-PEAK RUN TIME: N/A
OFF-PEAK RUN TIME: N/A
KWH FOR 20 DAYS: (480 HRS) x (410 KW) x 2 = 393,600 KWH

CHARGES

KWH CHARGE, FIRST 1000 KWH = (1000 KWH) x ($ .0755/KWH) =	$ 75.50
KWH CHARGE, OVER 1000 KWH = (393,600 KWH - 1000 KWH) x ($ .0642/KWH) =	$ 25,204.92
CUSTOMER CHARGE =	$ 11.60
SUBTOTAL =	$ 25,292.02
FEDERAL TAX =	$ 0
ICC TAX = ($ 25,292.02) x (.001) =	$ 25.29
STATE TAX = (393,600 KWH) x ($.0032/KWH) =	$ 1259.52
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 26,576.83 + X

These pumps may have to run 10 days during June and /or July. These are summer months. The calculations for this 10 day period would be covered under Rate Structures # 1, 2, and 5. The On-peak and Off-peak charges or KWH charges will be approximately half of those given in these Rate Structures. The On-peak Demand Charges and Customer Charges will remain unchanged. Hence, these 3 Rate Structures are listed below for the spring/summer runs.

RATE STRUCTURE #1-TWO 525 HP PUMPS RUNNING IN SPRING/SUMMER

RATE: 9T SUMMER
PERIOD: ON/OFF PEAK
TOTAL RUN TIME: JUN. 1-10, 2001 = 10 DAYS = 240 HRS
ON-PEAK RUN TIME: 6 HALF DAYS = 72 HRS
OFF-PEAK RUN TIME: 4 FULL DAYS + 6 HALF DAYS = 168 HRS
KWH FOR 10 DAYS: (240 HRS) x (410 KW) x 2 = 196800 KWH

CHARGES

ON-PEAK = (72 HRS) x (410 KW) x 2 → (59,040 KWH) x ($ .0398/KWH) =	$ 2349.79
OFF-PEAK = (168 HRS) x (410 KW) x 2 → (137,760 KWH) x ($ .0105/KWH) =	$ 1446.48
ON-PEAK DEMAND = (410 KW) x 2 x ($ 13.20/KW) =	$ 10,824.00
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 14,647.22
FEDERAL TAX =	$ 0
ICC TAX = ($ 14,647.22) x (.001) =	$ 14.65
STATE TAX = ($ 14,647.22) x (.05) =	$ 732.36
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 15,394.23 + X

RATE STRUCTURE #2-TWO 525 HP PUMPS RUNNING IN SPRING/SUMMER

RATE: 9T SUMMER
PERIOD: OFF PEAK
TOTAL RUN TIME: JUN. 1-16, 2001 = 15 1/2 DAYS = 240 HRS
ON-PEAK RUN TIME: 0
OFF-PEAK RUN TIME: 4 FULL DAYS + 12 HALF DAYS = 240 HRS
KWH FOR 15 1/2 DAYS: (240 HRS) x (410 KW) x 2 = 196,800 KWH

CHARGES

ON-PEAK =	$ 0
OFF-PEAK = (196,800 KWH) x ($ .0105/KWH) =	$ 2066.40
ON-PEAK DEMAND = (10 KW) x ($ 13.20/KW) =	$ 132.00
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 2225.35
FEDERAL TAX =	$ 0
ICC TAX = ($ 2225.35) x (.001) =	$ 2.23
STATE TAX = ($ 2225.35) x (.05) =	$ 111.27
FUEL ADJUSTMENT CLAUSE **DEMAND-SIDE ADJUSTMENT CLAUSE** **ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE**	$ X
TOTAL =	$ 2338.85 + X

RATE STRUCTURE #5-TWO 525 HP PUMPS RUNNING IN SPRING/SUMMER

RATE: 2B SUMMER
PERIOD: N/A
TOTAL RUN TIME: JUN. 1-10, 2001 = 10 DAYS = 240 HRS
ON-PEAK RUN TIME: N/A
OFF-PEAK RUN TIME: N/A
KWH FOR 10 DAYS: (240 HRS) x (410 KW) x 2 = 196,800 KWH

CHARGES

KWH CHARGE = (196,800 KWH) x ($ .0880/KWH) =	$ 17,318.40
CUSTOMER CHARGE =	$ 11.60
SUBTOTAL =	$ 17,330.00
FEDERAL TAX =	$ 0
ICC TAX = ($ 17,330.00) x (.001) =	$ 17.33
STATE TAX = ($ 17,330.00) x (.05) =	$ 866.50
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 18,213.83 + X

Three 215 HP pumps rated at 172 KW each.

<u>RATE STRUCTURE #1-THREE 215 HP PUMPS RUNNING IN FALL</u>

RATE: 9T SUMMER
PERIOD: ON/OFF PEAK
TOTAL RUN TIME: SEP. 1-20, 2001 = 20 DAYS = 480 HRS
ON-PEAK RUN TIME: 13 HALF DAYS = 156 HRS
OFF-PEAK RUN TIME: 7 FULL DAYS + 13 HALF DAYS = 324 HRS
KWH FOR 20 DAYS: (480 HRS) x (172 KW) x 3 = 247,680 KWH

<u>CHARGES</u>

ON-PEAK = (156 HRS) x (172 KW) x 3 → (80,496 KWH) x ($ .0398/KWH) =	$ 3203.74
OFF-PEAK = (324 HRS) x (172 KW) x 3 → (167,184 KWH) x ($ .0105/KWH) =	$ 1755.43
ON-PEAK DEMAND = (172 KW) x 3 x ($ 13.20/KW) =	$ 6811.20
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 11,797.32
FEDERAL TAX =	$ 0
ICC TAX = ($ 11,797.32) x (.001) =	$ 11.80
STATE TAX = ($ 11,797.32) x (.05) =	$ 589.87
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 12,398.99 + X

RATE STRUCTURE #2-THREE 215 HP PUMPS RUNNING IN FALL

RATE: 9T SUMMER
PERIOD: OFF PEAK
TOTAL RUN TIME: SEP. 1-30, 2001 = 29 1/2 DAYS = 480 HRS
ON-PEAK RUN TIME: 0
OFF-PEAK RUN TIME: 10 FULL DAYS + 20 HALF DAYS = 480 HRS
KWH FOR 29 1/2 DAYS: (480 HRS) x (172 KW) x 3 = 247,680 KWH

CHARGES

ON-PEAK =	$ 0
OFF-PEAK = (247,680 KWH) x ($ .0105/KWH) =	$ 2600.64
ON-PEAK DEMAND = (10 KW) x ($ 13.20/KW) =	$ 132.00
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 2759.59
FEDERAL TAX =	$ 0
ICC TAX = ($ 2759.59) x (.001) =	$ 2.76
STATE TAX = ($ 2759.59) x (.05) =	$ 137.98
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 2900.33 + X

RATE STRUCTURE #3-THREE 215 HP PUMPS RUNNING IN FALL

RATE: 9T WINTER
PERIOD: ON/OFF PEAK
TOTAL RUN TIME: OCT. 1-20, 2001 = 20 DAYS = 480 HRS
ON-PEAK RUN TIME: 15 HALF DAYS = 180 HRS
OFF-PEAK RUN TIME: 5 FULL DAYS + 15 HALF DAYS = 300 HRS
KWH FOR 20 DAYS: (480 HRS) x (172 KW) x 3 = 247,680 KWH

CHARGES

ON-PEAK = (180 HRS) x (172 KW) x 3 → (92,880 KWH) x ($ .0199/KWH) =	$ 1848.31
OFF-PEAK = (300 HRS) x (172 KW) x 3 → (154,800 KWH) x ($ .0105/KWH) =	$ 1625.40
ON-PEAK DEMAND = (172 KW) x 3 x ($ 10.71/KW) =	$ 5526.36
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 9027.02
FEDERAL TAX =	$ 0
ICC TAX = ($ 9027.02) x (.001) =	$ 9.03
STATE TAX = ($ 9027.02) x (.05) =	$ 451.35
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 9487.40 + X

<u>RATE STRUCTURE #4-THREE 215 HP PUMPS RUNNING IN FALL</u>

RATE: 9T WINTER
PERIOD: OFF PEAK
TOTAL RUN TIME: OCT. 1-NOV. 1, 2001 = 31 1/2 DAYS = 480 HRS
ON-PEAK RUN TIME: 0
OFF-PEAK RUN TIME: 8 FULL DAYS + 24 HALF DAYS = 480 HRS
KWH FOR 31 1/2 DAYS: (480 HRS) x (172 KW) x 3 = 247,680 KWH

<u>CHARGES</u>

ON-PEAK =	$ 0
OFF-PEAK = (247,680 KWH) x ($ .0105/KWH) =	$ 2600.64
ON-PEAK DEMAND = (10 KW) x ($ 10.71/KW) =	$ 107.10
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 2734.69
FEDERAL TAX =	$ 0
ICC TAX = ($ 2734.69) x (.001) =	$ 2.73
STATE TAX = ($ 2734.69) x (.05) =	$ 136.73
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 2874.15 + X

RATE STRUCTURE #5-THREE 215 HP PUMPS RUNNING IN FALL

RATE: 2B SUMMER
PERIOD: N/A
TOTAL RUN TIME: SEP. 1-20, 2001 = 20 DAYS = 480 HRS
ON-PEAK RUN TIME: N/A
OFF-PEAK RUN TIME: N/A
KWH FOR 20 DAYS: (480 HRS) x (172 KW) x 3 = 247,680 KWH

CHARGES

KWH CHARGE = (247,680 KWH) x ($ .0880/KWH) =	$ 21,795.84
CUSTOMER CHARGE =	$ 11.60
SUBTOTAL =	$ 21,807.44
FEDERAL TAX =	$ 0
ICC TAX = ($ 21,807.44) x (.001) =	$ 21.81
STATE TAX = ($ 21,807.44) x (.05) =	$ 1090.37
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 22,919.62 + X

RATE STRUCTURE #6-THREE 215 HP PUMPS RUNNING IN FALL

RATE: 2B WINTER
PERIOD: N/A
TOTAL RUN TIME: OCT. 1-20, 2001 = 20 DAYS = 480 HRS
ON-PEAK RUN TIME: N/A
OFF-PEAK RUN TIME: N/A
KWH FOR 20 DAYS: (480 HRS) x (172 KW) x 3 = 247,680 KWH

CHARGES

KWH CHARGE, FIRST 1000 KWH = (1000 KWH) x ($ .0755/KWH) =	$ 75.50
KWH CHARGE, OVER 1000 KWH = (247,680 KWH - 1000 KWH) x ($ .0642/KWH) =	$ 15,836.86
CUSTOMER CHARGE =	$ 11.60
SUBTOTAL =	$ 15,923.96
FEDERAL TAX =	$ 0
ICC TAX = ($ 15,923.96) x (.001) =	$ 15.92
STATE TAX = ($ 15,923.96) x (.05) =	$ 796.20
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 16,736.08 + X

These pumps may have to run 10 days during June and /or July. These are summer months. The calculations for this 10 day period would be covered under Rate Structures # 1, 2, and 5. The On-peak and Off-peak charges or KWH charges will be approximately half of those given in these Rate Structures. The On-peak Demand Charges and Customer Charges will remain unchanged. Hence, these 3 Rate Structures are listed below for the spring/summer runs.

RATE STRUCTURE #1-THREE 215 HP PUMPS RUNNING IN SPRING/SUMMER

RATE: 9T SUMMER
PERIOD: ON/OFF PEAK
TOTAL RUN TIME: JUN. 1-10, 2001 = 10 DAYS = 240 HRS
ON-PEAK RUN TIME: 6 HALF DAYS = 72 HRS
OFF-PEAK RUN TIME: 4 FULL DAYS + 6 HALF DAYS = 168 HRS
KWH FOR 10 DAYS: (240 HRS) x (172 KW) x 3 = 123,840 KWH

CHARGES

ON-PEAK = (72 HRS) x (172 KW) x 3 → (37,152 KWH) x ($ .0398/KWH) =	$	1478.65
OFF-PEAK = (168 HRS) x (172 KW) x 3 → (86,688 KWH) x ($ .0105/KWH) =	$	910.22
ON-PEAK DEMAND = (172 KW) x 3 x ($ 13.20/KW) =	$	6811.20
CUSTOMER CHARGE =	$	26.95
SUBTOTAL =	$	9227.02
FEDERAL TAX =	$	0
ICC TAX = ($ 9227.02) x (.001) =	$	9.23
STATE TAX = ($ 9227.02) x (.05) =	$	461.35
FUEL ADJUSTMENT CLAUSE		
DEMAND-SIDE ADJUSTMENT CLAUSE	$	X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE		
TOTAL =	$ 9697.60 + X	

RATE STRUCTURE #2-THREE 215 HP PUMPS RUNNING IN SPRING/SUMMER

RATE: 9T SUMMER
PERIOD: OFF PEAK
TOTAL RUN TIME: JUN. 1-16, 2001 = 15 1/2 DAYS = 240 HRS
ON-PEAK RUN TIME: 0
OFF-PEAK RUN TIME: 4 FULL DAYS + 12 HALF DAYS = 240 HRS
KWH FOR 15 1/2 DAYS: (240 HRS) x (172 KW) x 3 = 123,840 KWH

CHARGES

ON-PEAK =	$ 0
OFF-PEAK = (123,840 KWH) x ($ .0105/KWH) =	$ 1300.32
ON-PEAK DEMAND = (10 KW) x ($ 13.20/KW) =	$ 132.00
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 1459.27
FEDERAL TAX =	$ 0
ICC TAX = ($ 1459.27) x (.001) =	$ 1.46
STATE TAX = ($ 1459.27) x (.05) =	$ 72.96
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 1533.69 + X

RATE STRUCTURE #5-THREE 215 HP PUMPS RUNNING IN SPRING/SUMMER

RATE: 2B SUMMER
PERIOD: N/A
TOTAL RUN TIME: JUN. 1-10, 2001 = 10 DAYS = 240 HRS
ON-PEAK RUN TIME: N/A
OFF-PEAK RUN TIME: N/A
KWH FOR 10 DAYS: (240 HRS) x (172 KW) x 3 = 123,840 KWH

CHARGES

KWH CHARGE = (123,840 KWH) x ($ .0880/KWH) =	$ 10,897.92
CUSTOMER CHARGE =	$ 11.60
SUBTOTAL =	$ 10,909.52
FEDERAL TAX =	$ 0
ICC TAX = ($ 10,909.52) x (.001) =	$ 10.91
STATE TAX = ($ 10,909.52) x (.05) =	$ 545.48
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 11,465.91+ X

COMMENTS ON ABOVE RATE STRUCTURES

1. Rate Structure #1 (summer rate) is more expensive than Rate Structure #3 (winter rate).

2. Rate Structures #2 and 4 (Off-peak rates) are much cheaper than Rate Structures #1 and 3 (On-peak/Off-peak rates), although about 1/3 more time is needed to pump the same number of hours.

3. Rate Structures #5 and 6 demonstrate a straight price/KWH (rate 2B). This is the most expensive of all the rates.

4. Rider 13 to Rate 9T is available to be applied to this pump station billing if power is connected before January 1, 2000, unless CIPS is willing to extent it. This rate applies to Rate Structure # 3, the 9T winter rate. It says that we can cut the On-peak Demand charge by 50% for the first 5 years. This means that the On-peak Demand of $ 8782.20 can be cut in half to $ 4391.10. This means that this total bill will come out to $ 9911.34. Note that even with this break, the Off-peak rates, Rate Structures #2 and 4, are still cheaper than Rate Structure #3 with this Rider applied.

5. The three 215 HP pumps are cheaper to run than the two 525 HP pumps.

6. A prorated demand option may be available for the 9T rate. What this says is that if the On-peak usage is for 10 days or less during a billing period, then the demand rate will be broken down on a per day bases (up to 10 days maximum) and billed accordingly. If there is an On-peak usage for more than 10 days in a month, the regular 9T rate would apply. With the scenarios used in the Rate Structures, the pumps are run too many days a month to get any benefit from this option, although it should be open to consideration if plans change.

7. When on the 9T rate, (Rate Structures 1,2,3, and 4) on the months when the pump station is not in use, there will be a minimum billing for 10 KW for the On-peak Demand and the Customer Charge, plus the taxes, FAC, DSAC, and EEAC. An example is as follows:

On-peak =	$ 0
Off-peak =	$ 0
On-peak Demand = (10 KW) x ($ 13.20/KW) =	$ 132.00
Customer charge =	$ 26.95
Taxes =	$ 8.11
FAC, DSAC, & EEAC =	$ X
Total =	$ 167.06 + X

The above example is for summer rate. For winter rate, the $ 13.20 is replaced with $ 10.71. This leads to a total of $ 140.88.

For the 2B rate, the minimum charge is the Customer Charge which is $ 11.60 plus taxes, FAC, DSAC, and EEAC.

RECOMMENDATIONS

1. Since Rate Structures #2 and 4 (Off-peak rates) are so much cheaper than the other Rate Structures, installation of rate 9T Time-of -Day metering is recommended. If these pumps are to be operated in automatic mode, a timer may be installed to lock out On-peak running time.

2. It is cheaper and more versatile to operate three 215 HP pumps rather two 525 HP pumps for the following reasons:

    a) The total HP or KW per 100,000 GPM of water pumped is less for the three 215 HP pumps Vs the two 525 HP pumps.
    b) The three 215 HP pumps offer the ability to pump in smaller increments when compared to the alternative. That is, if a small quantity of pumping needs to be done, only 1 or 2 of the three pumps need to be activated.
    c) If one pump needs to be taken out of service, the pump station is still 66.67% functional with three 215 HP pumps and only 50% functional with two 525 HP pumps.

Yearly Calendar October 21, 2001 KRR-1.OR2

2001

January 2001

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

February 2001

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28			

March 2001

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

April 2001

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

May 2001

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

June 2001

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

July 2001

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

August 2001

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

September 2001

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

October 2001

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

November 2001

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

December 2001

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

PLATE I-29

Subject RICE LAKE		Date OCT. 29, 1996
Computed by RJW	Checked by	Sheet 1 of

TWO 525 HP PUMPS

MOTOR FLA = 475A

SAFETY FACTOR = 475A x 125% = 593.75A

CONDUCTORS: ONE 1500 MCM/ϕ WILL CARRY 625A

$\frac{593.75A}{2}$ = 296.88A → TWO 350 MCM/ϕ WILL CARRY 310A ea.

$\frac{593.75A}{3}$ = 197.92A → THREE 3/0 CONDUCTORS/ϕ WILL CARRY 200A ea.

RGS CONDUIT: USING XHHW CONDUCTORS.

THREE 1500 MCM AND ONE 1500 MCM GND → 6" DIA.

THREE 350 MCM AND ONE 350 MCM GRN → 3" DIA. x 2

THREE 3/0 AND ONE ~~3/0~~ GRN → 2" DIA. x 3

TO FEED EACH MOTOR FROM THE CONTROLLER:

GO WITH TWO 350 MCM CONDUCTORS/ϕ. POWER FEED WILL BE TWO 3" RGS CONDUITS, EACH CONDUIT CONTAINING 3ϕ AND 1 GND.

NCR Form 1 Aug 80 381b

Subject RICE LAKE		Date OCT. 29, 1996
Computed by RJW	Checked by	Sheet 2 of

THREE 215 HP PUMPS

MOTOR FLA = 345 A

SAFETY FACTOR = 345A x 125% = 431.25 A

CONDUCTORS:

ONE 700 MCM/ϕ WILL CARRY 460A

$\frac{431.25A}{2}$ = 215.63A → TWO 4/0 WILL CARRY 230A ea.

RGS CONDUIT: USING XHHW CONDUCTORS.

THREE 700 MCM AND ONE 700 MCM GND → 3½" DIA.

THREE 4/0 AND ONE 4/0 GND → 2" DIA. x 2

TO FEED EACH MOTOR FROM THE CONTROLLER:

GO WITH TWO 4/0 CONDUCTORS/ϕ. POWER FEED WILL BE TWO 2" RGS CONDUITS, EACH CONDUIT CONTAINING 3 ϕ AND 1 GND.

Subject: RICE LAKE		Date: OCT. 29, 1996
Computed by: RJW	Checked by	Sheet 3 of

PUMP STATION SERVICE FROM METER TO MAIN DISCONNECT

2 - 525 HP PUMPS

FLA = 475A x 2 = 950A

SAFETY FACTOR = 950A x 125% = 1187.5A

CONDUCTORS:

2 - 1500 MCM/ϕ = 1250A

2 - 1250 MCM/ϕ = 1180A

3 - 600 MCM/ϕ = 1260A

4 - 350 MCM/ϕ = 1240A

CONDUIT: XHHW CONDUCTORS.

2 RGS CONDUITS - EA CARRIES 3-1500 MCM + 1-1500 MCM GND = 6" DIA

3 RGS CONDUITS - EA CARRIES 3-600 MCM + 1-600 MCM GND = 3½" DIA.

4 RGS CONDUITS - EA CARRIES 3-350 MCM + 1-350 MCM GND = 3" DIA

SUGGEST GOING WITH 4 - 350 MCM's/ϕ.
RUN 4 - 3" TO 4" DIAMETER RGS CONDUIT,
EACH CONDUIT CONTAINS 3 ϕ + 1 GND.

NCR Form 381b
1 Aug 80

Subject RICE LAKE			Date OCT. 29, 1996
Computed by RJW	Checked by		Sheet 4 of

PUMP STATION SERVICE FROM METER TO MAIN DISCONNECT

3 — 315 HP PUMPS

FLA = 345A x 3 = 1035 A

SAFETY FACTOR = 1035A x 125% = 1293.75 A

CONDUCTORS:

2-1750 MCM/Ø = 1300A

3-700 MCM/Ø = 1380 A

4- 400 MCM/Ø = 1340 A

CONDUIT: XHHW CONDUCTORS

2 RGS CONDUITS — EA CARRIES 3-1750 MCM + 1-1750 MCM GND = 6" DIA.

3 " " — " " 3-700 MCM + 1-700 MCM GND = 3½" DIA.

4 " " — " " 3-400 MCM + 1-400 MCM GND = 3" DIA.

SUGGEST GOING WITH 4-400 MCM's/Ø.
RUN 4 — 3" TO 4" DIAMETER RGS CONDUIT,
EACH CONDUIT CONTAINS 3 Ø + 1 GND.

RATE 2B — GENERAL SERVICE
(Bill/Rate Code 520)

AVAILABILITY

Available for any Customer within territory served by Company.

*NET RATE PER MONTH

Customer Charge
$11.60

Energy Charge

Summer Rate (1)	Winter Rate (2)
8.80 cents per kwh for all kwh used	7.55 cents per kwh for the first 1,000 kwh used 6.42 cents per kwh for all over 1,000 kwh used

Subject to "Fuel Adjustment" Sheet No. 36.

(1) The summer rate shall apply during the monthly billing period ending about June 1st (billing cycle 6) of each year and the following three consecutive monthly billing periods.

(2) The winter rate shall apply during all other monthly billing periods.

DISCOUNT

When the Customer agrees to accept delivery of energy at the available primary voltage (a) without additional expense to the Company and (b) the Customer assumes the responsibility and expense of subsequent voltage reduction, if any, a discount equal to 4 percent of the amount of the Customer's net energy charges will be allowed.

MINIMUM BILL

The customer charge each month.

*UNMETERED SERVICE

Upon request, the Company will provide unmetered service for connected loads not exceeding 2 kilowatts where operation of the customer's equipment is continuous or is regularly scheduled on an annual basis. For the purposes of billing in such cases, the monthly kwh shall be determined by multiplying the rated wattage (based upon nameplate or other appropriate data) of the connected loads by one-twelfth of the annual hours of operation and dividing by 1,000. The first 70 kwh so determined shall be included in the Customer Charge. The energy charges stated above will apply to all kwh in excess of 70 kwh.

TERMS OF PAYMENT

Customer's bills will be computed at the net rates, and there will be added to any portion of such bill remaining unpaid fourteen days from the date of issue of the bill a sum equivalent to one and a half (1½) percent of the unpaid balance.

TERMS AND CONDITIONS

Service hereunder is subject to the general "Terms and Conditions" and "Tax Additions" of this Schedule, and the following further conditions:

Loads to be served under this schedule may be subject to special contract arrangements as set forth under the "Customer Facilities Charges" section of the Terms and Conditions of this Schedule.

A written service agreement may be required to take service for a period of years as agreed to by and between Customer and Company

Three phase service may be available to Customers under the "Rural Extension Policy" or the "Customer Facilities Charges" provisions of the Terms and Conditions Section of this Schedule.

Date of Filing, March 19, 1992
Pursuant to Order of the Illinois
Commerce Commission entered
March 18, 1992, in Docket No. 91-0193

Issued by C. L. GREENWALT, President
607 East Adams Street, Springfield, Illinois 62739

Date Effective, March 20, 1992

PLATE 1–34

Asterisk denotes change

*RATE 9T — LIGHT AND POWER
*TIME-OF-USE SERVICE

AVAILABILITY

Available for any Customer within territory served by Company.

*NET RATE PER MONTH

Customer Charge $26.95

	Summer Rate (1)	Winter Rate (2)
Demand Charge per KW of billing demand:	$13.20	$10.71
Energy Charge for all KWH used during:		
On-peak periods (3)	3.98 cents per KWH	1.99 cents per KWH
Off-peak periods (3)	1.05 cents per KWH	1.05 cents per KWH

Provided that the sum of the Demand and Energy charges above divided by the number of KWH used shall not be greater than 10 cents per KWH in a winter billing period, nor greater than 12 cents per KWH in a summer billing period.

Subject to "Fuel Adjustment" Sheet No. 36.

(1) The summer rate shall apply during the monthly billing period ending about June 1st (billing cycle 6) of each year and the following three consecutive monthly billing periods.

(2) The winter rate shall apply during all other monthly billing periods.

(3) "On-peak" periods, for purposes hereof, shall be the hours of 10:00 A.M. to 10:00 P.M. on Monday through Friday, except on days on which the following holidays are observed in Illinois: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day. "Off-peak" hours shall be all other hours.

Monthly Maximum Demand:

*The monthly maximum demand shall be the highest rate of energy use during any 15 consecutive minutes occurring in such month. The Company may determine the average lagging power factor each month, and if found to be less than 90 per cent, the demand charge in such month shall be increased by an amount equal to 20 cents for each kilovoltampere, or fraction thereof, of capacitors required to correct the power factor from the per cent to 90 per cent lagging.

Billing Demand:

The billing demand for each month shall be the highest demand established during on-peak hours in such month, or 10 KW, whichever is greater.

DISCOUNT

*When the Customer agrees to accept delivery of energy at the available primary voltage (a) without additional expense to the Company and (b) the Customer assumes the responsibility and expense of subsequent voltage reductions, if any, a discount equal to 6 percent of the amount of the Customer's net demand charge will be allowed. If such service is unregulated the total discount shall be equal to 7 percent of the net demand charge.

When the Customer agrees to accept delivery of energy at the available transmission voltage (a) without additional expense to the Company and (b) the Customer assumes the responsibility and expense of subsequent voltage reduction, if any, a discount equal to 10 percent of the amount of the Customer's net demand charges will be allowed.

Date of Filing, March 19, 1992
Pursuant to Order of the Illinois
Commerce Commission entered
March 18, 1992, in Docket No. 91-0193

Issued by C. L. GREENWALT, President
607 East Adams Street, Springfield, Illinois 62739

Date Effective, March 20, 1992

Asterisk denotes change

*RATE 9T — LIGHT AND POWER

*TIME-OF-USE SERVICE

(Continued from Sheet No. 13.5)

*MINIMUM BILL

The sum of the Customer and Demand Charges each month, provided, however, the total of the payments to the Company by Customer for services hereunder shall be not less than $70.00 per kilowatt for each yearly contract period based on the highest summer monthly billing demand which has occurred in said yearly period.

TERMS OF PAYMENT

Customers' bills will be computed at the net rates and there will be added to any portion of such bill remaining unpaid fourteen days from the date of issue of the bill a sum equivalent to one and a half (1½) percent of the unpaid balance.

TERMS AND CONDITIONS

Service hereunder is subject to the general "Terms and Conditions" and "Tax Additions" of this Schedule, and the following further conditions:

Loads to be served under this schedule may be subject to special contract arrangements.

A written service agreement may be required to take service for a period of years as agreed to by and between Customer and Company.

Date of Filing, March 19, 1992
Pursuant to Order of the Illinois
Commerce Commission entered
March 18, 1992, in Docket No. 91-0193

Issued by C. L. GREENWALT, President
607 East Adams Street, Springfield, Illinois 62739

Date Effective, March 20, 1992

Asterisk denotes change

.M cornell

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY

September 30, 1994

#Name
#Title
#DD
#Address1
#Address2
#csz

Dear Sir:

CIPS is offering a prorated demand for drainage districts that are now on, or might like to consider being on, time of day rates. What this means is that instead of the entire demand charge being billed for onpeak usage after 15 minutes of use, the demand rate will be broken down on a per day basis (up to 10 days maximum) and billed accordingly. If there is onpeak usage for more than 10 days in a month, the regular 9T rate would apply.

An example of this concept is as follows:

9T Summer Demand = $13.20/KW

Assume a 200 horsepower motor, the billing presently 200 h.p. x .746 KW/h.p. x $13.20 => $1,969.44 for a demand set during any 15 minutes on peak.

While the proposed billing, for say a 3 day onpeak period, will be 200 h.p. x .746 KW/h.p. x $13.20/20 days x 3 days => $295.42.

As you can readily see, the savings for onpeak use can be substantial. The energy usage in KWH will still be billed at the present rate. I've enclosed a 9T rate sheet for your reference.

To be able to determine the number of days pumping was done onpeak, an electronic recorder will need to be installed and either a telephone line or cellular phone will also be needed. This service would involve an additional monthly charge of approximately $27.00 per month from CIPS plus you will possibly have either telephone or cellular service charges as well.

DIVISION OFFICE 104 E. THIRD STREET BEARDSTOWN, ILLINOIS 62618 217/323-2173

If you are interested in this service or would like more information, please call me at 1-800-543-2477 or write me at 104 East Third Street, Beardstown, IL 62618.

Sincerely,

J. K. McKinney
Customer Services Supervisor

JKM/cad

bxc: SEBradshaw
SPine
GHazel
AAustin
VPerry
DBuck
LSmith
JFowler
SHeikes
MCornell
DO'Brien
TRawlins

COST ESTIMATE

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J

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17D)

RICE LAKE STATE FISH AND WILDLIFE AREA
HABITAT REHABILITATION AND ENHANCEMENT

LA GRANGE POOL, ILLINOIS WATERWAY
MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

APPENDIX J
DETAILED ESTIMATE OF COST

1. **General.** Table 15-1 of the main report contains the detailed cost estimate prepared for the Rice Lake Rehabilitation and Enhancement Project at Illinois River Miles 132.0 - 138.0, including Federal construction, planning, engineering, and design, and construction management costs. The current working estimate (CWE) prepared for this Definite Project Report (DPR) level study was developed after review of project plans, discussion with the design team members, and review of costs for similar construction projects. The Micro-Computer Aided Cost Estimating System (M-CACES) was utilized to assemble and calculate project element cost. Costs, including appropriate contingencies, are presented in accordance with EC 1110-2-536, Civil Works Project Cost Estimating - Code of Accounts.

2. **Price Level.** Project element costs are based on December 1996 prices. These costs are considered fair and reasonable to a well-equipped and capable contractor and include overhead and profit. Calculation of the Fully Funded Estimate (FFE) was done in accordance with guidance from CECW-B, dated 23 Feb 94, for Factors for Updating Study/Project Cost Estimates for FY 1996 Budget Submission.

3. **Contingency Discussion.** After review of project documents and discussion with personnel involved in the project, cost contingencies were developed which reflect the uncertainty associated with each cost item. Per EC 1110-2-263, these contingencies are based on qualified cost engineering judgment of the available design data, type of work involved, and uncertainties associated with the work and schedule. Costs were not added to contingency amounts to cover items which are identified project requirements. The following discussion of major project features indicates the basis for contingency selection and assumptions made. For other elements not addressed below, the assignment of contingencies was deemed appropriate to account for the uncertainty in design and quantity calculation and further discussion is not included.

a. Feature 01, Lands and Damages.

The estimate for this feature is based on work required by Real Estate which is described in greater detail in the main report under REAL ESTATE REQUIREMENTS.

b. Feature 06, Fish and Wildlife Facilities.

The quantities for this work were developed by the Design and Cost Engineering Branches.

a. Perimeter Water Control Dike. The Rice Lake Complex has historically served as valuable habitat for migratory waterfowl and local wildlife. Due to construction and maintenance of a 9-foot navigation channel on the Illinois River, this series of loosely connected backwater lakes, surrounded by agricultural fields, has been transformed into a more or less contiguous lake. The dike will be constructed of dredged sand to an elevation of 442 with 5 to 1 side slopes and a 10-foot crown width. The dike will be designed with a riprap or gabion spillway structure at an elevation of 440 to allow the interior water level of the Goose Lake/Big Lake component of the complex to equalize with the river level before overtopping the water control dike. To allow maximum flexibility and to minimize the operation and maintenance cost of the project, two gated 60-inch-diameter corrugated metal pipe culverts will be installed at the southwest corner of Goose Lake.

b. Pump Station. A new pump station is proposed as shown on plate 2. The location of the pump station was chosen to allow accessible water conveyance without predictable maintenance dredging problems. Two features were considered to optimize the pump station. Several thousand feet of ditches are required to convey the water to and from the lakes. These ditch sections will be constructed by a combination of mechanical excavation and embankment placement.

c. Mast Tree Plantings. This feature consists of planting mast-producing trees at the locations shown on plate 2 of the main report. Mast trees would be planted on approximately 100 acres of Duck Island which are currently cultivated for agricultural purposes. Because the area to be planted is currently in agricultural production, it will be ideal for mast tree establishment because minimal site preparation would be required. The objective of the proposed tree planting would be to enhance the habitat value of the forest resource by introducing a component of mast-producing species into a forest dominated by silver maple and cottonwood. Species to be planted would include pin oak, swamp white oak, bur oak, pecan, and sycamore. Duck Island is the highest area in the Rice Lake Wildlife Area and best suited to support trees that are moderately tolerant of flooding. Large seedling stock greater than 4 feet will be planted. Tree planting operations will involve disking to a depth of 4 inches, followed by excavation of planting holes. Planting of red top grass and annual grains will be established in the tree planting area to control unwanted weed species. Herbicides will be used, as necessary, for a 3-year establishment period.

d. Warm Season Grass Planting. The Rice Lake site is currently dominated by two habitat types, open water and woody terrestrial. Approximately 200 acres of the land currently being used for agricultural purposes will be used for planting a mixture of warm season grasses. Species selected include big bluestem (*Andropogon gerardii*), Little bluestem (*Schizarchyrium scoparium*), Indian grass (*Soprghastrum nutans*), sideoats gramma (*Bouteloua curtipendula*), and perennial rye grass as a cover crop. Planting will begin in the spring no earlier than March 15th and will be completed no later than May 5th. If planted in the fall, starting and ending dates will be October 1st and November 15th.

e. Fish Egress Structure. The Rice Lake site has experienced numerous outbreaks of avian botulism attributed to the reduction of water levels in the upper lake. It is believed that providing a route for fish to escape from the lake will reduce fish kills and the associated occurrence of avian botulism. Therefore, a gated 60-inch CMP culvert will be installed between the gravel pit on Duck Island and Rice Lake.

The average contingency for the project's construction is 20 percent.

c. Feature 30, Planning, Engineering & Design.

The engineering and design for this project includes all planning and design work necessary to complete the Definite Project Report and construction plans and specifications. This cost also includes engineering support during construction, and preparation of as-built drawings and operation and maintenance manuals. The design effort for the construction was analyzed to determine the man-year effort required. This estimate is based upon money expended to date, discussions between the project engineer and project manager, and historical data and experience gained on other projects of similar nature.

d. Feature 31, Construction Management.

Construction management includes studies and analyses of project reports, plans and specification, and conferences of construction staff to become familiar with design requirements; biddability, contractibility, and operability reviews pre-award activities to acquaint prospective bidders with the nature of the work; administration of construction contracts administration of A/E contracts which provide for supervision and inspection; establishment of bench marks and baselines required for layouts of construction, relocations, and clearing; review of shop drawings, manuals, catalog cuts, and other information submitted by the construction contractor; assure specifications compliance by supervision and inspection on construction work, conferences with the contractors to coordinate various features of the project and enforce compliance with schedules; sampling and testing during construction phase to determine suitability and compliance with plans and specifications; negotiate with the contractor on all contract modifications, including preparation of all contract documents required therefor; estimate quantities, determine periodic payments to contractors, and prepare, review and approve contract payments; review and approve construction schedules and progress charts; prepare progress and completion reports; project management and administration not otherwise identified; and district overhead. These costs may be incurred at the job site, an area office, or at the District. For the Phase I construction of the Rice Lake Rehabilitation and Enhancement

EMP project, the estimated cost of construction management is $70,190 for a construction contract with an estimated value of $2,147,406. For the Phase II construction of the Rice Lake Rehabilitation and Enhancement EMP project, the estimated cost of construction management is $323,940 for a construction contract with an estimated value of $5,007,880. The construction contract for both Phase I and Phase II has about a 2-year duration and an estimated value of $7,155,286.

LITERATURE CITED

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APPENDIX K
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CHARLES CRIST ATTN: CEMVP-PE-M US ARMY ENGINEER DIST - ST PAUL 190 FIFTH ST E ST PAUL MN 55101-1638	1	1	1			1
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PAM GIBSON IL COUNCIL OF WATERSHEDS 866 DOOLIN JACKSONVILLE IL 62650		1				

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I -Draft Coordination Documents
II - Public Review Documents
III - Administration Approval Documents
IV - Construction Plans and Specifications
V - Operations and Maintenance Instructions
VI - Project Performance Evaluation Documents

RICE LAKE, IL 10Y_ SEP 97	I	II	III	IV	V	VI	1/
DARLENE J BRUCE NATURAL RESOURCES CHAIRPERSON LEAGUE OF WOMEN VOTERS 505 W CRESTWOOD DR PEORIA IL 61614		1					
PAUL KRONE NATURAL RESOURCES CONSERVATION SVC 1902 FOX DR CHAMPAIGN IL 61820		1					
MILDRED BRYANT ILLINOIS RIVER VALLEY RESIDENTS 3120 N CALIFORNIA PEORIA IL 61603		1					
SHIRLEY O'CONNELL HEART OF ILLINOIS SIERRA CLUB 1609 N KNOLLWOOD CT PEORIA IL 61604		1					
BILL GRANT DIRECTOR - MIDWEST OFFICE IZAAK WALTON LEAGUE OF AMERICA 5701 NORMANDALE RD RM 317 MINNEAPOLIS MN 55424		1					
PAUL HANSEN EXECUTIVE DIRECTOR IZAAK WALTON LEAGUE OF AMERICA 707 CONSERVATION LANE GAITHERSBURG MD 20878-2983		1					

1/
I -Draft Coordination Documents
II - Public Review Documents
III - Administration Approval Documents
IV - Construction Plans and Specifications
V - Operations and Maintenance Instructions
VI - Project Performance Evaluation Documents

RICE LAKE, IL 10Y_ SEP 97	I	II	III	IV	V	VI	1/
MICHAEL REUTER NATURE CONSERVENCY *COMMERICE BANK BLDG-416 MAIN ST-STE 1600* PEORIA IL 61602		1					
TOM EDWARDS RIVER RESCUE 2702 N PEORIA AVE PEORIA IL 61603		1					
BILL REDDING ASSOCIATE REPRESENTATIVE SIERRA CLUB 214 N HENRY ST STE 203 MADISON WI 53703		1					
HOLLY STOERKER DIRECTOR UPPER MISSISSIPPI RIVER BASIN ASSOC 415 HAMM BLDG 408 ST PETER ST ST PAUL MN 55102	1	1	1			1	
JON DUYVEJONCK UMRCC COORDINATOR US FISH AND WILDLIFE SERVICE - RIFO 4469 48TH AVE CT ROCK ISLAND IL 61201	1	1	1		1	1	
JOHN MCCLENATHAN VICE PRESIDENT - GRAIN MARKETING GROWMARK 1701 TONAWANDA AVE PO BOX 2500 BLOOMINGTON IL 61701		1					

1/
I -Draft Coordination Documents
II - Public Review Documents
III - Administration Approval Documents
IV - Construction Plans and Specifications
V - Operations and Maintenance Instructions
VI - Project Performance Evaluation Documents

RICE LAKE, IL 10Y_ SEP 97	I	II	III	IV	V	VI	1/
JOURNAL STAR - NEWS ROOM 1 NEWS PLAZA PEORIA IL 61643		1					
WBYS RADIO STATION BOX 600 CANTON IL 61520		1					
WGLO RADIO - NEWS ROOM 28 S 4TH ST PEKIN IL 61554		1					
WIRL RADIO - NEWS ROOM PO BOX 3335 PEORIA IL 61614		1					
WMBD RADIO - NEWS ROOM 3131 N UNIVERSITY ST PEORIA IL 61604		1					
GARY MOORE WXCL RADIO - NEWS ROOM 3641 N MEADOWBROOK RD PEORIA IL 61615		1					

1/
I -Draft Coordination Documents
II - Public Review Documents
III - Administration Approval Documents
IV - Construction Plans and Specifications
V - Operations and Maintenance Instructions
VI - Project Performance Evaluation Documents

RICE LAKE, IL 10Y SEP 97	I	II	III	IV	V	VI 1/
WEEK-TV CHANNEL 25 - NEWS ROOM 2907 SPRINGFIELD RD EAST PEORIA IL 61611		1				
WHOI-TV - NEWS ROOM 50 N STEWART ST CREVE COEUR IL 61622		1				
WTVP-TV CHANNEL 47 - NEWS ROOM 1501 W BRADLEY AVE PEORIA IL 61625		1				
AL & LINDA BEHM 89 SALDANA WAY HOTSPRINGS VILLAGE AR 71909-7401		1				

1/
I -Draft Coordination Documents
II - Public Review Documents
III - Administration Approval Documents
IV - Construction Plans and Specifications
V - Operations and Maintenance Instructions
VI - Project Performance Evaluation Documents

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U.S. Army Engineer District, Rock Island
Clock Tower Building
P.O. Box 2004
Rock Island, Illinois 61204-2004

	I	II	III	IV	V	VI	1/
CEMVR-DE	1	1	1			1	
CEMVR-CD	1	1	1	11	1	1	
CEMVR-CD-E		1	1	1		1	
CEMVR-CT	1	1	1	1			
CEMVR-ED	1	1	1	1	1	1	
CEMVR-ED-C				1			
CEMVR-ED-D	1	1	1	1	1	1	
CEMVR-ED-DE				5			
CEMVR-ED-DN	3	3	3	1	1	1	
CEMVR-ED-DS	1	1	1	1	1	1	
CEMVR-ED-G	1	1	1	1	1	1	
CEMVR-ED-H	1	1	1	1	1	1	
CEMVR-ED-HH	1	1	1	1	1	1	
CEMVR-ED-HQ	1	1	1		1	1	
CEMVR-ED-T				1			
CEMVR-IM-CL			2				
CEMVR-LM				1			
CEMVR-OC				1			
CEMVR-OD	1	1	1	1	1	1	
CEMVR-OD-SI	1	1	1	1	1	1	
CEMVR-OD-T (DEVOS)	1	1	1	1	1	1	
CEMVR-OD-MN		1	1	1	1	1	1
CEMVR-PA	1	1	1			1	
CEMVR-PD	2	2	2			2	
CEMVR-PD-E	1	10	10	1	1	1	
CEMVR-PD-W (NILES)	1	1	1	1	1	1	
CEMVR-PD-W (SKALAK)	1	1	1	1	1	1	
CEMVR-PP-M (KOWALCZYK)	1	1	1		1	1	
CEMVR-PP-P				1			
CEMVR-RE	1	1	1				
CEMVR-RE-A	1	1	1				

1/
I - Draft Coordination Documents
II - Public Review Documents
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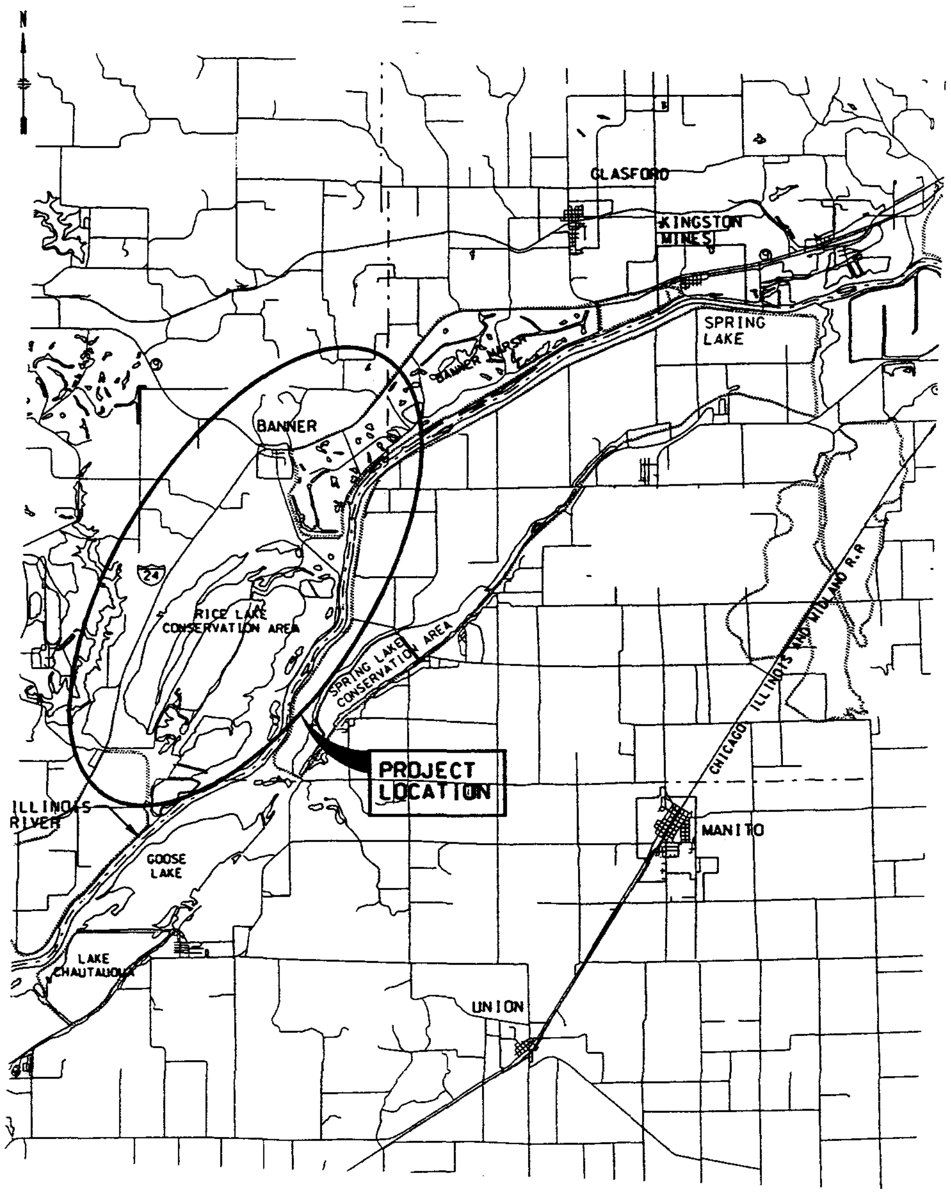
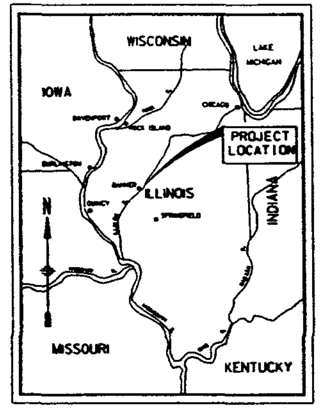
IV - Construction Plans and Specifications
V - Operations and Maintenance Instructions
VI - Project Performance Evaluation Documents



PLAN



VICINITY MAP

US Army Corps of Engineers Rock Island District

Symbol	Description	Date	Approved

Revisions

Designed By: RDH	Date: XXXXXXXX		
Drawn By: SDB	Scale: AS SHOWN		
Checked By: RDH	Drawing Code: XXXXXXXX		
Reviewed By: DJJ	Solicitation Number: DACW25-XX-B-XXXX		

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
RICE LAKE

LOCATION MAP AND VICINITY PLAN

Sheet Reference Number:

Sheet 2 of

PLATE 1

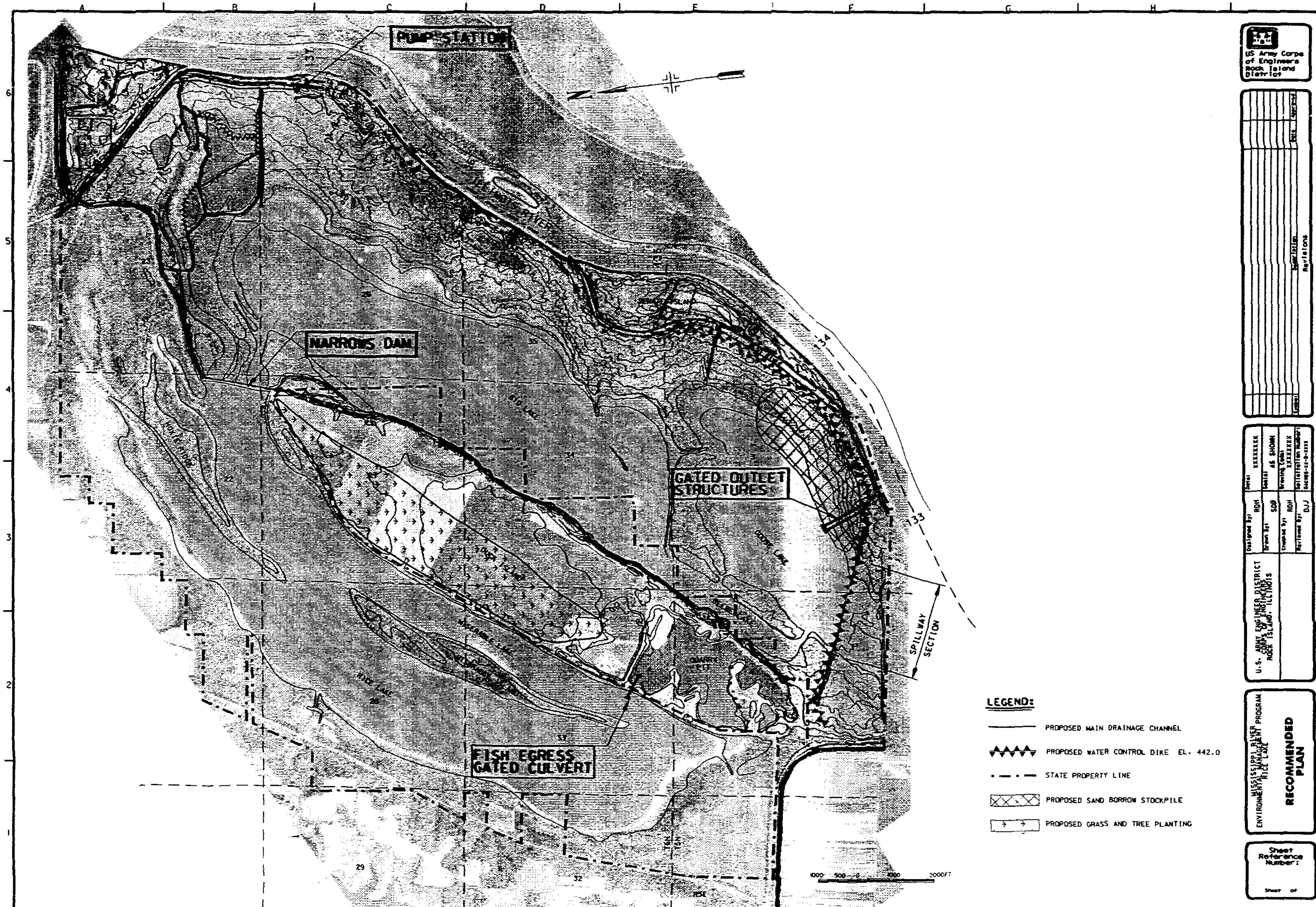
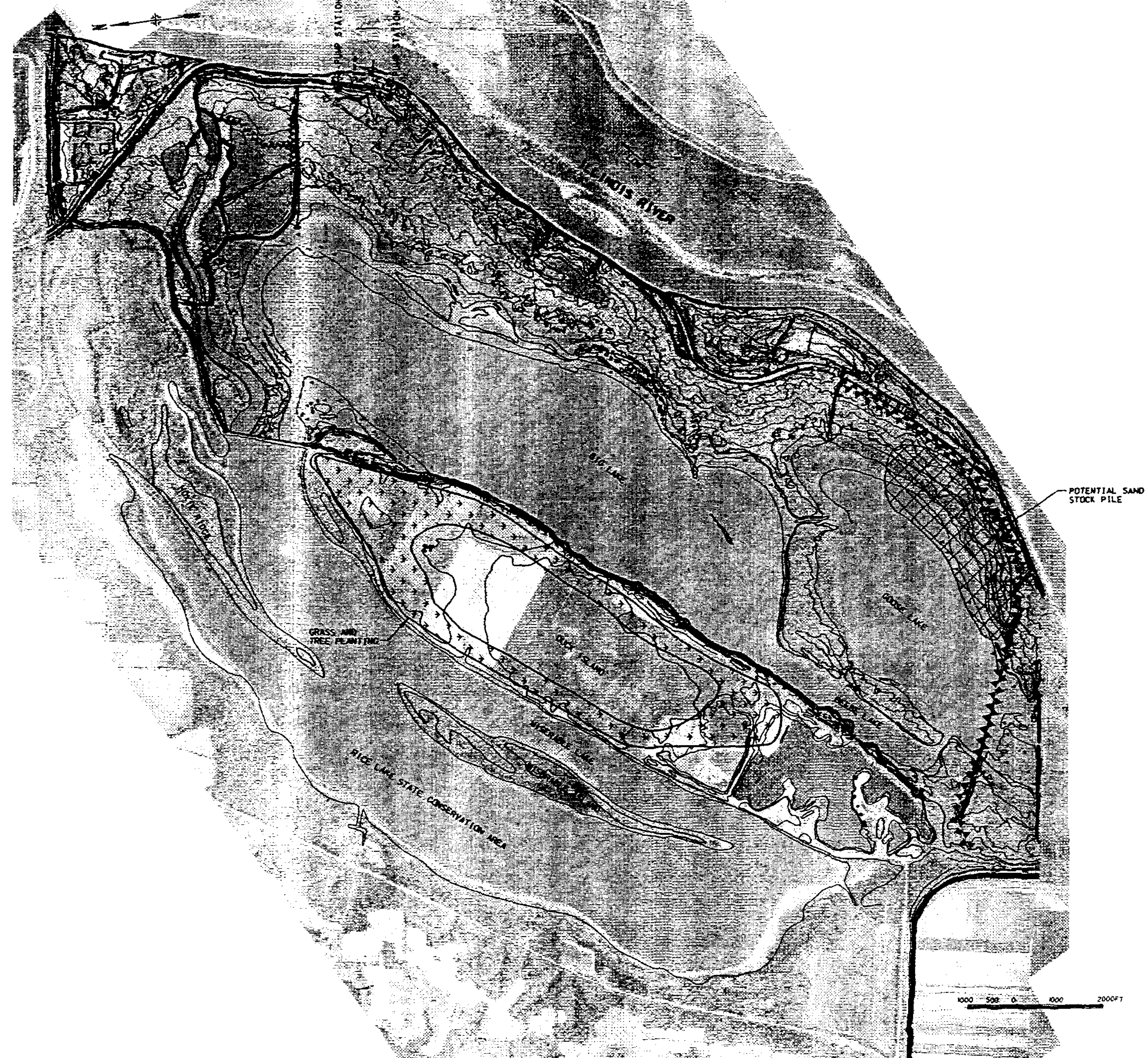

PUMP STATION
NARROWS DAM
GATED OUTLET STRUCTURES
FISH EGRESS GATED CULVERT
SPILLWAY SECTION
BIG LAKE
GOOSE LAKE
RICE LAKE
QUARRY PIT
134
133
LEGEND:
PROPOSED MAIN DRAINAGE CHANNEL
PROPOSED WATER CONTROL DIKE EL. 442.0
STATE PROPERTY LINE
PROPOSED SAND BORROW STOCKPILE
PROPOSED GRASS AND TREE PLANTING
1000 500 0 1000 2000FT
US Army Corps of Engineers Rock Island District
Revisions
Designed by: RDH
Drawn by: SDB
Checked by: RDH
Reviewed by: DJJ
Date: XXXXXXXX
Scale: AS SHOWN
Drawing Code: XXXXXXXX
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS
MISSISSIPPI RIVER ENVIRONMENTAL MANAGEMENT PROGRAM RICE LAKE
RECOMMENDED PLAN
Sheet Reference Number:
Sheet of

PLATE 2



LEGEND:

PROPOSED MAIN DRAINAGE CHANNEL

PROPOSED SECONDARY DRAINAGE CHANNEL

PROPOSED MSU DIKE

PROPOSED DEFLECTION LEVEE EL. 440.0

US Army Corps of Engineers Rock Island District

Symbol	Descriptions	Date	Approved
	Revisions		

Designed By: RDH	Date: XXXXXXXX
Drawn By: SDB	Scale: AS SHOWN
Checked By: RDH	Drawing Code: XXXXXXXX
Reviewed By: DJJ	Solicitation Number: DACW25-XX-X-XXXX

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
RICE LAKE

ALTERNATIVE PLAN

Sheet Reference Number:

Sheet of

30-SEP-1997 14:04

PLATE 3

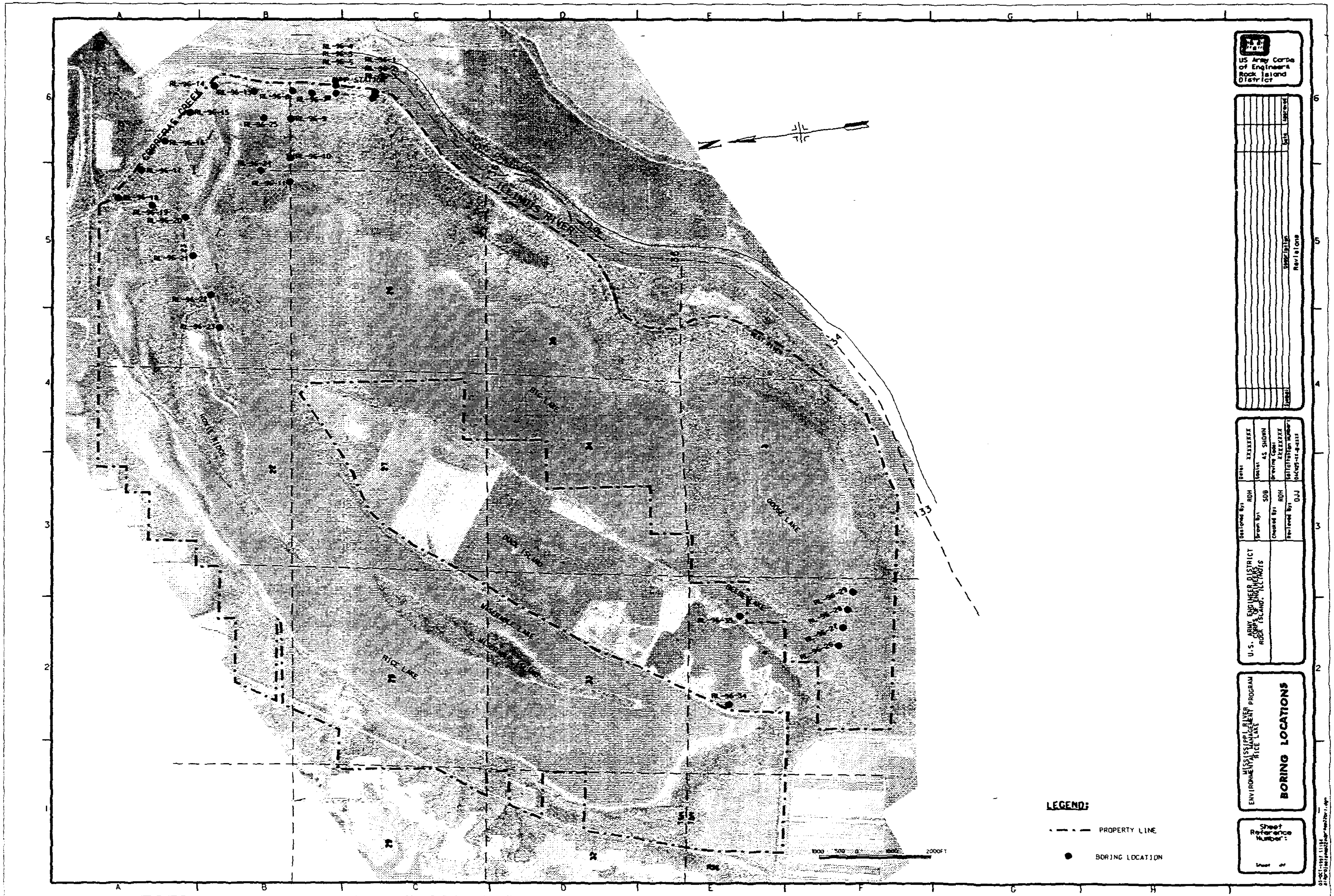
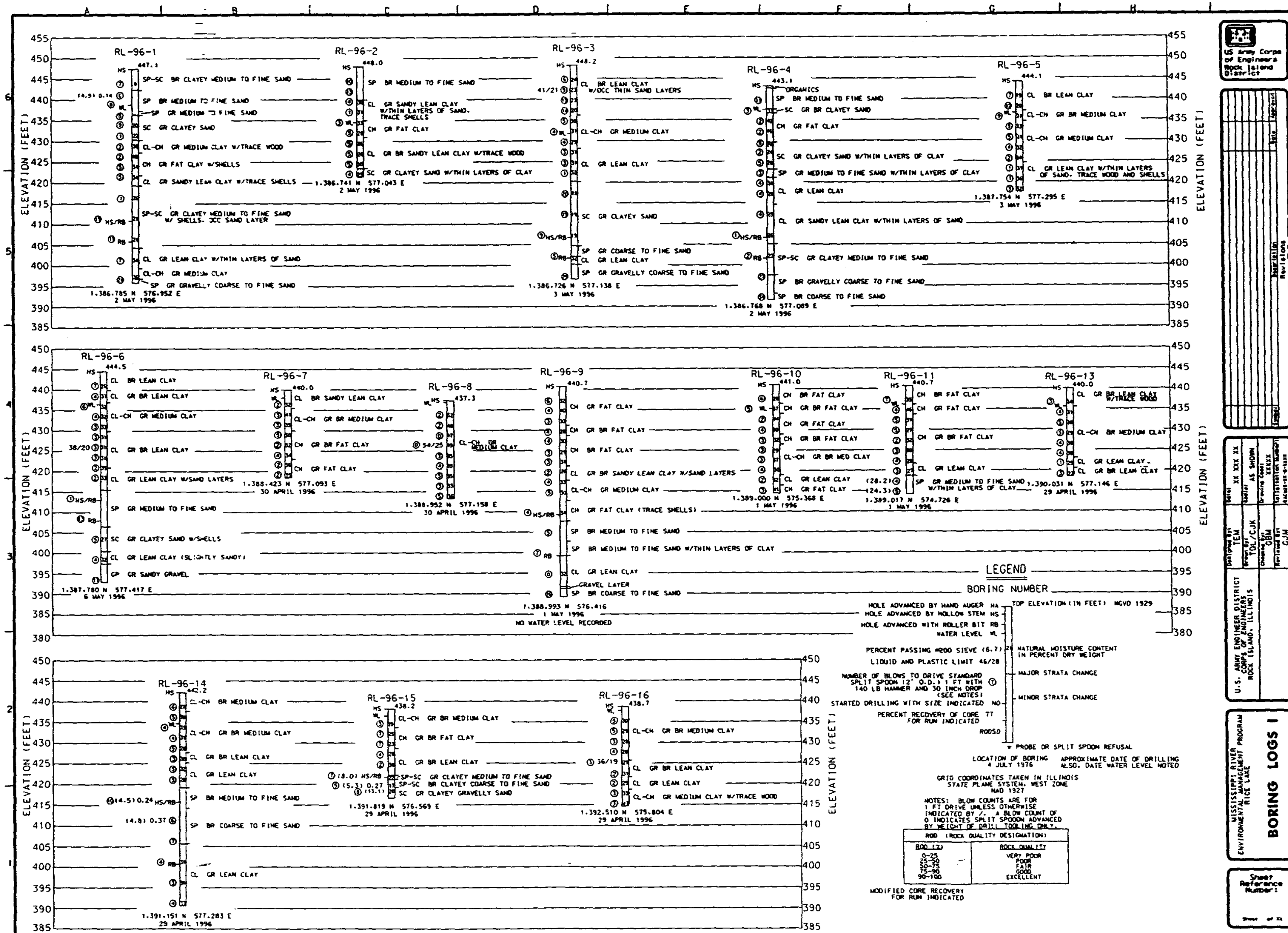
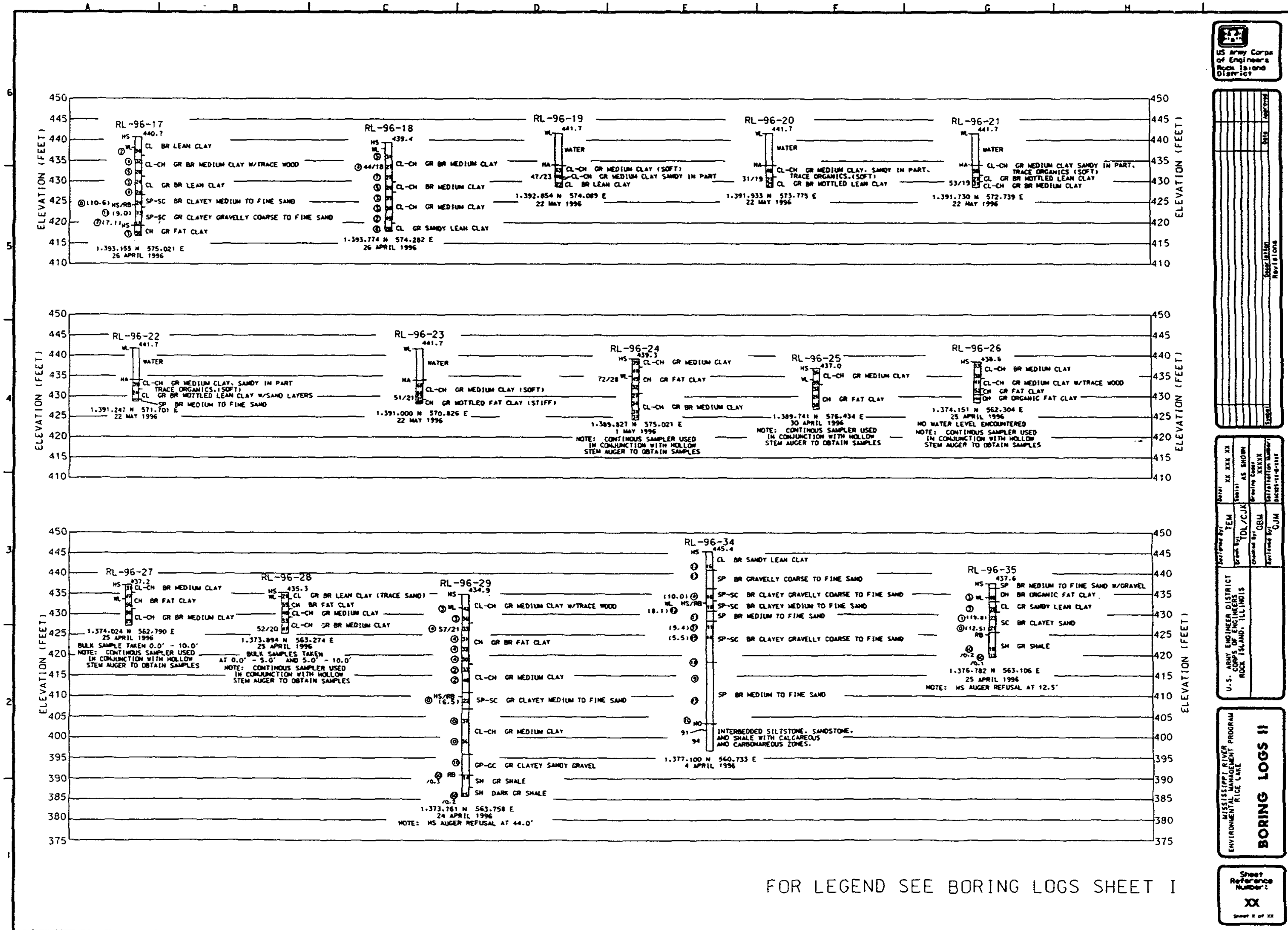

US Army Corps of Engineers Rock Island District
ILLINOIS RIVER
RICE LAKE
GOOSE LAKE
LEGEND:
PROPERTY LINE
BORING LOCATION
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS
BORING LOCATIONS

PLATE 4



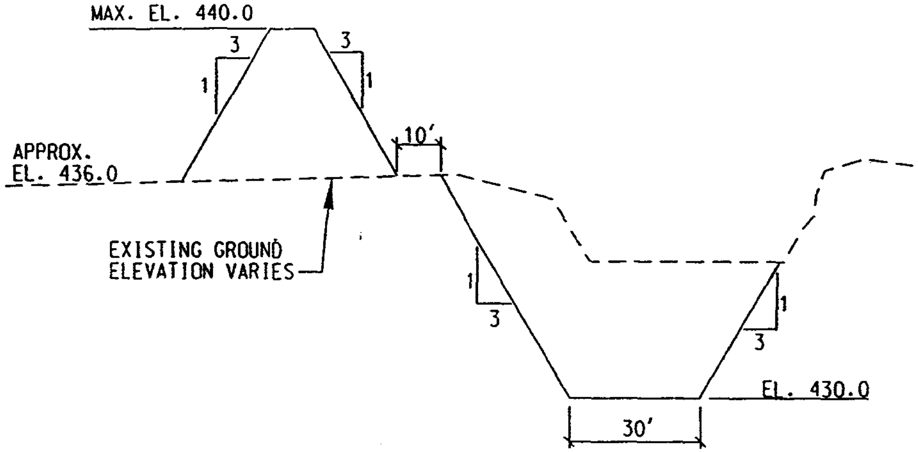
RL-96-1
RL-96-2
RL-96-3
RL-96-4
RL-96-5
RL-96-6
RL-96-7
RL-96-8
RL-96-9
RL-96-10
RL-96-11
RL-96-13
RL-96-14
RL-96-15
RL-96-16
ELEVATION (FEET)
LEGEND
BORING NUMBER
TOP ELEVATION (IN FEET) NGVD 1929
HOLE ADVANCED BY HAND AUGER HA
HOLE ADVANCED BY HOLLOW STEM HS
HOLE ADVANCED WITH ROLLER BIT RB
WATER LEVEL WL
PERCENT PASSING #200 SIEVE (6.7)
NATURAL MOISTURE CONTENT IN PERCENT DRY WEIGHT
LIQUID AND PLASTIC LIMIT 46/28
MAJOR STRATA CHANGE
NUMBER OF BLOWS TO DRIVE STANDARD SPLIT SPOON (2" O.D.) 1 FT WITH 140 LB HAMMER AND 30 INCH DROP (SEE NOTES)
MINOR STRATA CHANGE
STARTED DRILLING WITH SIZE INDICATED NQ
PERCENT RECOVERY OF CORE 77 FOR RUN INDICATED
* PROBE OR SPLIT SPOON REFUSAL
LOCATION OF BORING 4 JULY 1976
APPROXIMATE DATE OF DRILLING ALSO, DATE WATER LEVEL NOTED
GRID COORDINATES TAKEN IN ILLINOIS STATE PLANE SYSTEM, WEST ZONE NAD 1927
NOTES: BLOW COUNTS ARE FOR 1 FT DRIVE UNLESS OTHERWISE INDICATED BY /. A BLOW COUNT OF 0 INDICATES SPLIT SPOON ADVANCED BY WEIGHT OF DRILL TOOLING ONLY.
RQD (ROCK QUALITY DESIGNATION)
RQD (%) ROCK QUALITY
0-25 VERY POOR
25-50 POOR
50-75 FAIR
75-90 GOOD
90-100 EXCELLENT
MODIFIED CORE RECOVERY FOR RUN INDICATED
NO WATER LEVEL RECORDED
US Army Corps of Engineers Rock Island District
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS
MISSISSIPPI RIVER ENVIRONMENTAL MANAGEMENT PROGRAM RICE LAKE
BORING LOGS I
Sheet Reference Number:

PLATE 5



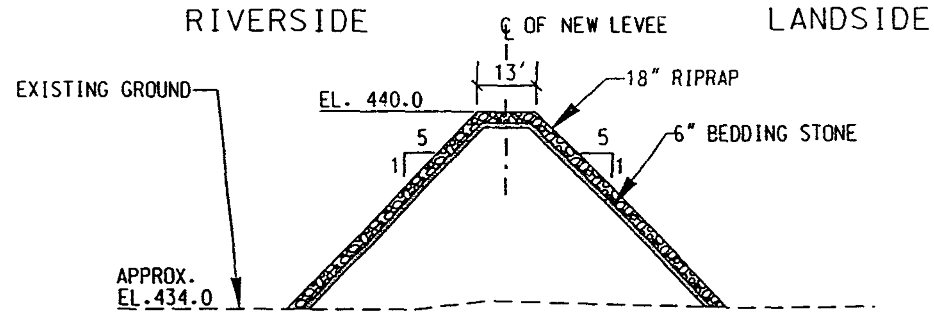
US Army Corps of Engineers Rock Island District
RL-96-17
440.7
CL BR LEAN CLAY
CL-CH GR BR MEDIUM CLAY W/TRACE WOOD
CL GR BR LEAN CLAY
SP-SC BR CLAYEY MEDIUM TO FINE SAND
SP-SC GR CLAYEY GRAVELLY COARSE TO FINE SAND
CH GR FAT CLAY
1,393,155 N 575,021 E
26 APRIL 1996
RL-96-18
439.4
CL-CH GR BR MEDIUM CLAY
CL-CH BR MEDIUM CLAY
CL-CH GR MEDIUM CLAY
CL GR SANDY LEAN CLAY
1,393,774 N 574,282 E
26 APRIL 1996
RL-96-19
441.7
WATER
CL-CH GR MEDIUM CLAY (SOFT)
CL-CH GR MEDIUM CLAY SANDY IN PART
CL BR LEAN CLAY
1,392,854 N 574,089 E
22 MAY 1996
RL-96-20
441.7
WATER
CL-CH GR MEDIUM CLAY, SANDY IN PART, TRACE ORGANICS (SOFT)
CL GR BR MOTTLED LEAN CLAY
1,391,933 N 573,775 E
22 MAY 1996
RL-96-21
441.7
WATER
CL-CH GR MEDIUM CLAY SANDY IN PART, TRACE ORGANICS (SOFT)
CL GR BR MOTTLED LEAN CLAY
CL-CH GR BR MEDIUM CLAY
1,391,730 N 572,739 E
22 MAY 1996
RL-96-22
441.7
WATER
CL-CH GR MEDIUM CLAY, SANDY IN PART TRACE ORGANICS (SOFT)
CL GR BR MOTTLED LEAN CLAY W/SAND LAYERS
SP BR MEDIUM TO FINE SAND
1,391,247 N 571,701 E
22 MAY 1996
RL-96-23
441.7
WATER
CL-CH GR MEDIUM CLAY (SOFT)
CH GR MOTTLED FAT CLAY (STIFF)
1,391,000 N 570,826 E
22 MAY 1996
RL-96-24
439.3
CL-CH GR MEDIUM CLAY
CH GR FAT CLAY
CL-CH GR BR MEDIUM CLAY
1,389,827 N 575,021 E
1 MAY 1996
NOTE: CONTINOUS SAMPLER USED IN CONJUNCTION WITH HOLLOW STEM AUGER TO OBTAIN SAMPLES
RL-96-25
437.0
CL-CH GR MEDIUM CLAY
CH GR FAT CLAY
1,389,741 N 576,434 E
30 APRIL 1996
NOTE: CONTINOUS SAMPLER USED IN CONJUNCTION WITH HOLLOW STEM AUGER TO OBTAIN SAMPLES
RL-96-26
438.6
CL-CH BR MEDIUM CLAY
CL-CH GR MEDIUM CLAY W/TRACE WOOD
CH GR FAT CLAY
OH GR ORGANIC FAT CLAY
1,374,151 N 562,304 E
25 APRIL 1996
NO WATER LEVEL ENCOUNTERED
NOTE: CONTINOUS SAMPLER USED IN CONJUNCTION WITH HOLLOW STEM AUGER TO OBTAIN SAMPLES
RL-96-27
437.2
CL-CH BR MEDIUM CLAY
CH BR FAT CLAY
CL-CH GR BR MEDIUM CLAY
1,374,024 N 562,790 E
25 APRIL 1996
BULK SAMPLE TAKEN 0.0' - 10.0'
NOTE: CONTINOUS SAMPLER USED IN CONJUNCTION WITH HOLLOW STEM AUGER TO OBTAIN SAMPLES
RL-96-28
435.3
CL GR BR LEAN CLAY (TRACE SAND)
CH BR FAT CLAY
CL-CH GR MEDIUM CLAY
CL-CH GR BR MEDIUM CLAY
1,373,894 N 563,274 E
25 APRIL 1996
BULK SAMPLES TAKEN AT 0.0' - 5.0' AND 5.0' - 10.0'
NOTE: CONTINOUS SAMPLER USED IN CONJUNCTION WITH HOLLOW STEM AUGER TO OBTAIN SAMPLES
RL-96-29
434.9
CL-CH GR MEDIUM CLAY W/TRACE WOOD
CH GR BR FAT CLAY
CL-CH GR MEDIUM CLAY
SP-SC GR CLAYEY MEDIUM TO FINE SAND
CL-CH GR MEDIUM CLAY
GP-GC GR CLAYEY SANDY GRAVEL
SH GR SHALE
SH DARK GR SHALE
1,373,761 N 563,758 E
24 APRIL 1996
NOTE: HS AUGER REFUSAL AT 44.0'
RL-96-34
445.4
CL BR SANDY LEAN CLAY
SP BR GRAVELLY COARSE TO FINE SAND
SP-SC BR CLAYEY GRAVELLY COARSE TO FINE SAND
SP-SC BR CLAYEY MEDIUM TO FINE SAND
SP BR MEDIUM TO FINE SAND
SP-SC BR CLAYEY GRAVELLY COARSE TO FINE SAND
SP BR MEDIUM TO FINE SAND
INTERBEDDED SILTSTONE, SANDSTONE, AND SHALE WITH CALCAREOUS AND CARBONAREOUS ZONES.
1,377,100 N 560,733 E
4 APRIL 1996
RL-96-35
437.6
SP BR MEDIUM TO FINE SAND W/GRAVEL
OH BR ORGANIC FAT CLAY
CL GR SANDY LEAN CLAY
SC BR CLAYEY SAND
SH GR SHALE
1,376,782 N 563,106 E
25 APRIL 1996
NOTE: HS AUGER REFUSAL AT 12.5'
ELEVATION (FEET)
FOR LEGEND SEE BORING LOGS SHEET I
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS
MISSISSIPPI RIVER ENVIRONMENTAL MANAGEMENT PROGRAM RICE LAKE
BORING LOGS II
Sheet Reference Number: XX

PLATE 6

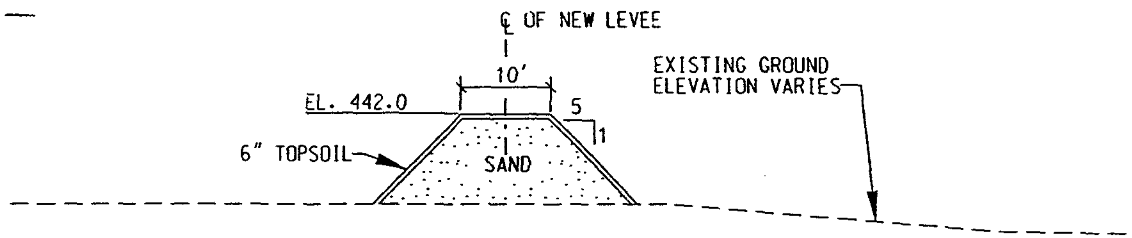


STA. 37+00

MAINDRAIN TYPICAL SECTION



SPILLWAY TYPICAL SECTION



STA. 139+00

DEFLECTION TYPICAL LEVEE

US Army Corps of Engineers Rock Island District

Designed by: RDH | Drawn by: SDB | Checked by: RDH | Reviewed by: DJJ | Scale: AS SHOWN

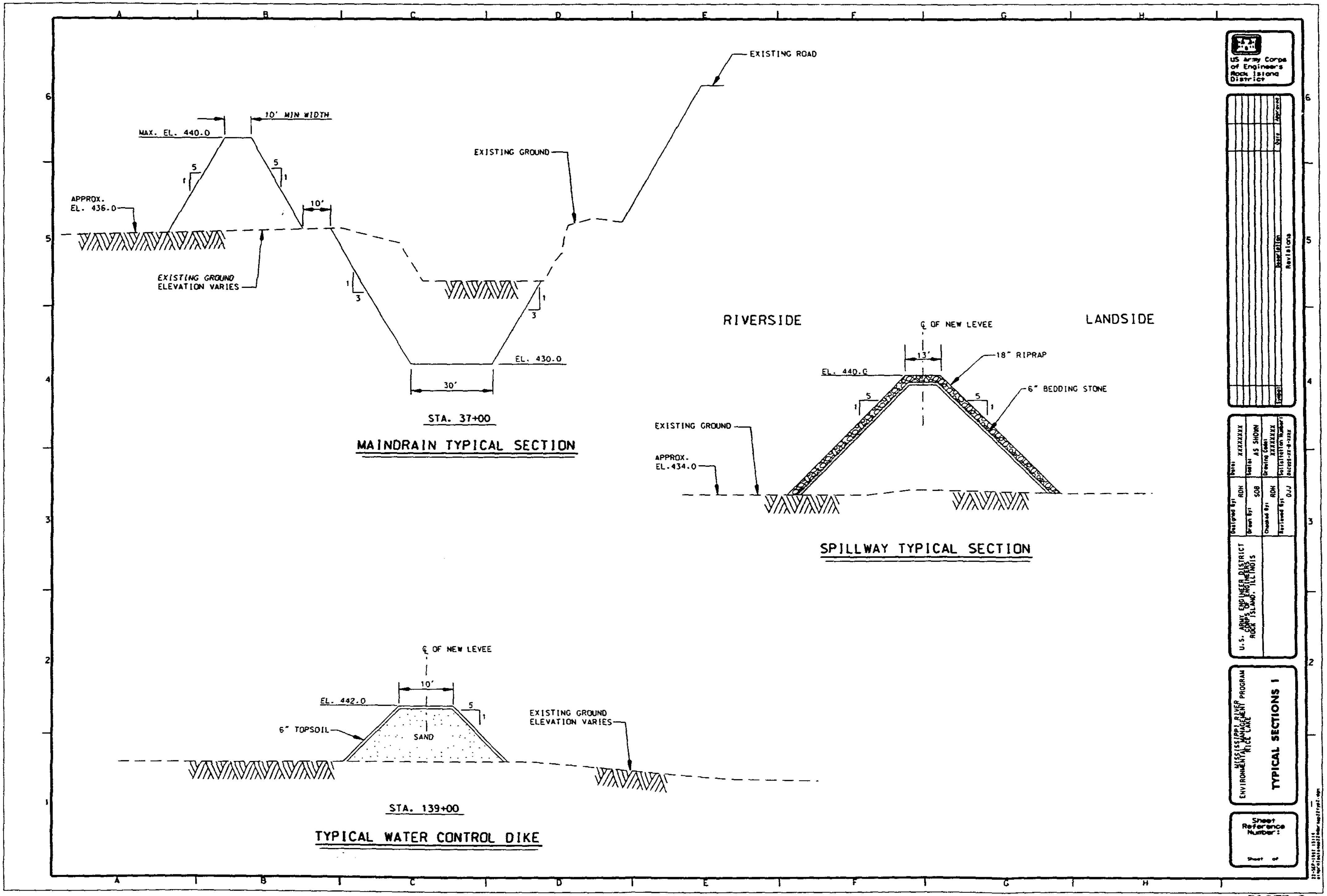
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER ENVIRONMENTAL MANAGEMENT PROGRAM RICE LAKE

TYPICAL SECTIONS

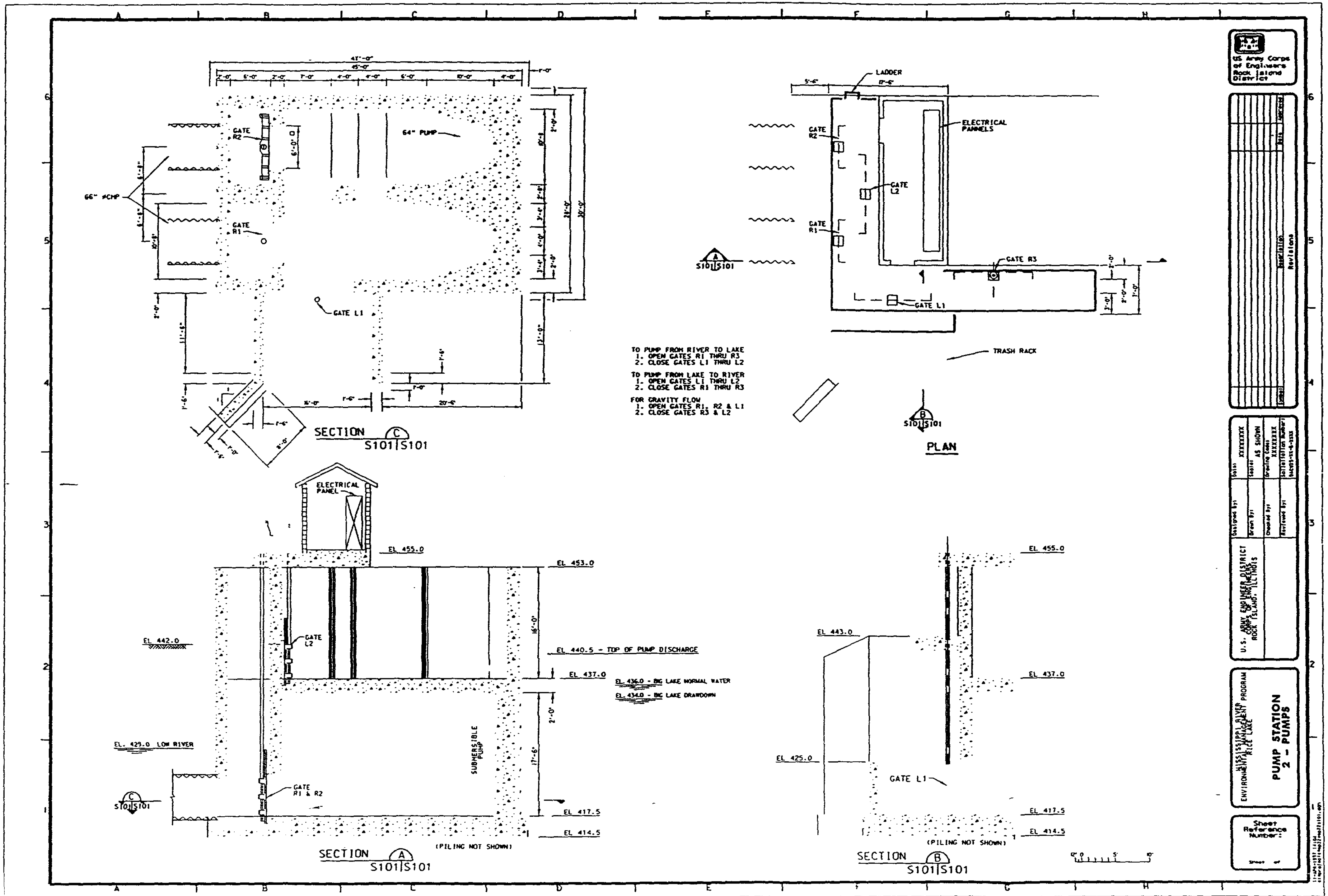
Sheet Reference Number:

PLATE 7



EXISTING ROAD
10' MIN WIDTH
MAX. EL. 440.0
APPROX.
EL. 436.0
EXISTING GROUND
10'
EXISTING GROUND
ELEVATION VARIES
EL. 430.0
30'
STA. 37+00
MAINDRAIN TYPICAL SECTION
RIVERSIDE
LANDSIDE
℄ OF NEW LEVEE
13'
18" RIPRAP
EL. 440.0
6" BEDDING STONE
EXISTING GROUND
APPROX.
EL.434.0
SPILLWAY TYPICAL SECTION
℄ OF NEW LEVEE
10'
EL. 442.0
6" TOPSOIL
SAND
EXISTING GROUND
ELEVATION VARIES
STA. 139+00
TYPICAL WATER CONTROL DIKE
US Army Corps
of Engineers
Rock Island
District
Revisions
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS
MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
RICE LAKE
TYPICAL SECTIONS 1
AS SHOWN
Sheet
Reference
Number:

PLATE 8



47'-0"
45'-0"
GATE R2
64" PUMP
66" ØCMP
GATE R1
GATE L1
SECTION C
S101 S101
ELECTRICAL PANEL
EL 455.0
EL 453.0
EL 442.0
GATE L2
EL 440.5 - TOP OF PUMP DISCHARGE
EL 437.0
EL 436.0 - BIG LAKE NORMAL WATER
EL 434.0 - BIG LAKE DRAWDOWN
EL. 429.0 LOW RIVER
SUBMERSIBLE PUMP
GATE R1 & R2
EL 417.5
EL 414.5
(PILING NOT SHOWN)
SECTION A
S101 S101
TO PUMP FROM RIVER TO LAKE
1. OPEN GATES R1 THRU R3
2. CLOSE GATES L1 THRU L2
TO PUMP FROM LAKE TO RIVER
1. OPEN GATES L1 THRU L2
2. CLOSE GATES R1 THRU R3
FOR GRAVITY FLOW
1. OPEN GATES R1, R2 & L1
2. CLOSE GATES R3 & L2
LADDER
ELECTRICAL PANNELS
GATE L2
GATE R3
TRASH RACK
PLAN
EL 443.0
EL 425.0
GATE L1
SECTION B
S101 S101
US Army Corps of Engineers Rock Island District
Revisions
Designed by:
Drawn by:
Checked by:
Reviewed by:
Date: XXXXXXXX
Scale: AS SHOWN
Drawing Code: XXXXXXXX
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS
MISSISSIPPI RIVER ENVIRONMENTAL MANAGEMENT PROGRAM RICE LAKE
PUMP STATION 2 - PUMPS
Sheet Reference Number:

PLATE 9

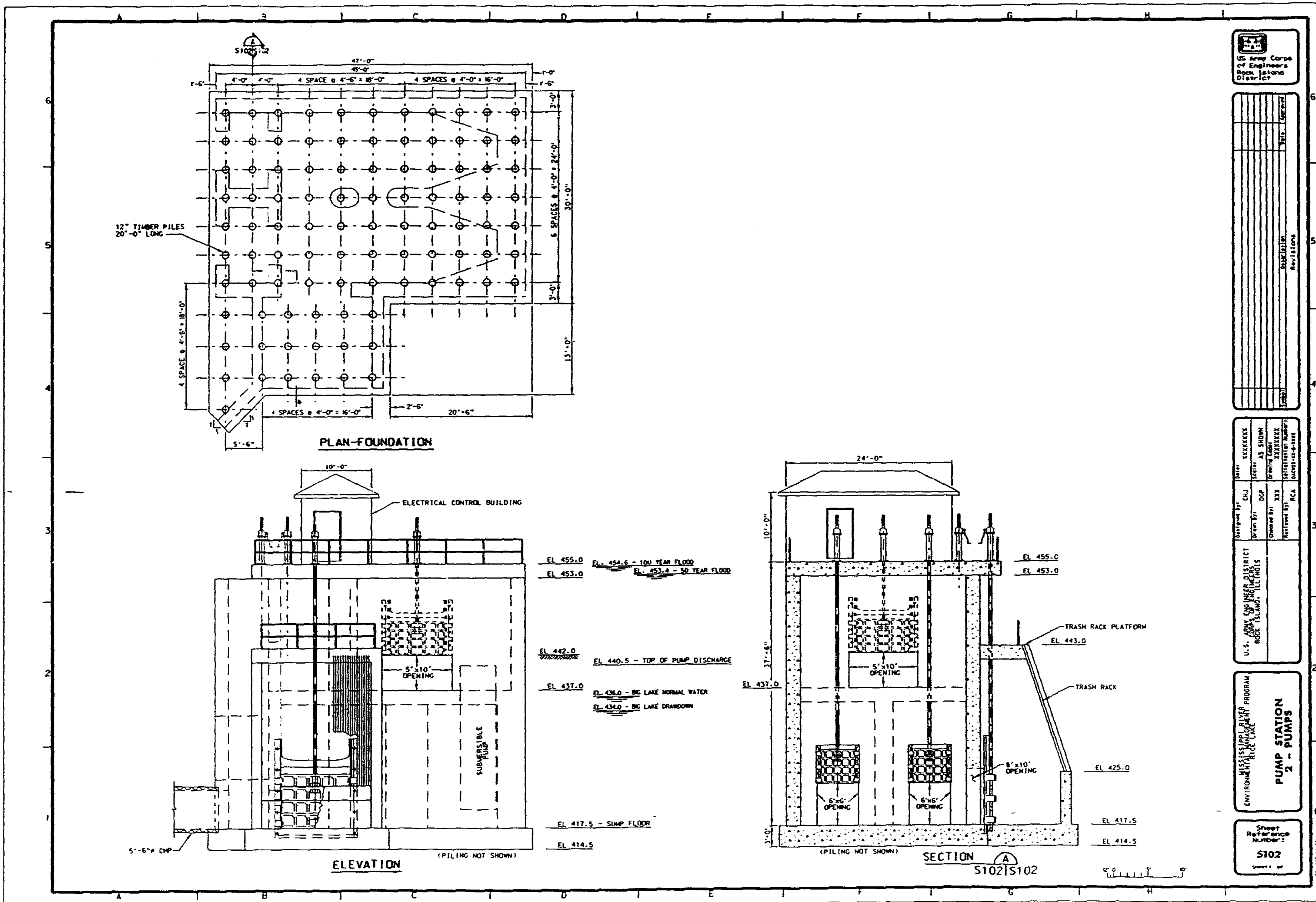

PLAN-FOUNDATION
12" TIMBER PILES 20'-0" LONG
47'-0"
45'-0"
4 SPACE @ 4'-6" = 18'-0"
4 SPACES @ 4'-0" = 16'-0"
6 SPACES @ 4'-0" = 24'-0"
30'-0"
13'-0"
4 SPACE @ 4'-6" = 18'-0"
4 SPACES @ 4'-0" = 16'-0"
2'-6"
20'-6"
5'-6"
ELEVATION
10'-0"
ELECTRICAL CONTROL BUILDING
EL 455.0
EL 453.0
EL 454.6 - 100 YEAR FLOOD
EL 453.4 - 50 YEAR FLOOD
EL 442.0
EL 440.5 - TOP OF PUMP DISCHARGE
5'x10' OPENING
EL 437.0
EL 436.0 - BIG LAKE NORMAL WATER
EL 434.0 - BIG LAKE DRAWDOWN
SUBMERSIBLE PUMP
EL 417.5 - SUMP FLOOR
EL 414.5
5'-6"ø CMP
(PILING NOT SHOWN)
SECTION A S102 S102
24'-0"
10'-0"
37'-6"
3'-0"
EL 455.0
EL 453.0
EL 437.0
TRASH RACK PLATFORM
EL 443.0
TRASH RACK
5'x10' OPENING
8'x10' OPENING
EL 425.0
6'x6' OPENING
6'x6' OPENING
EL 417.5
EL 414.5
(PILING NOT SHOWN)
US Army Corps of Engineers Rock Island District
Revisions
Designed by: CHJ
Drawn by: DGP
Checked by: XXX
Reviewed by: RCA
Date: XXXXXXXX
Scale: AS SHOWN
Drawing Code: XXXXXXXX
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS
MISSISSIPPI RIVER ENVIRONMENTAL MANAGEMENT PROGRAM RICE LAKE
PUMP STATION 2 - PUMPS
Sheet Reference Number: S102

PLATE 10

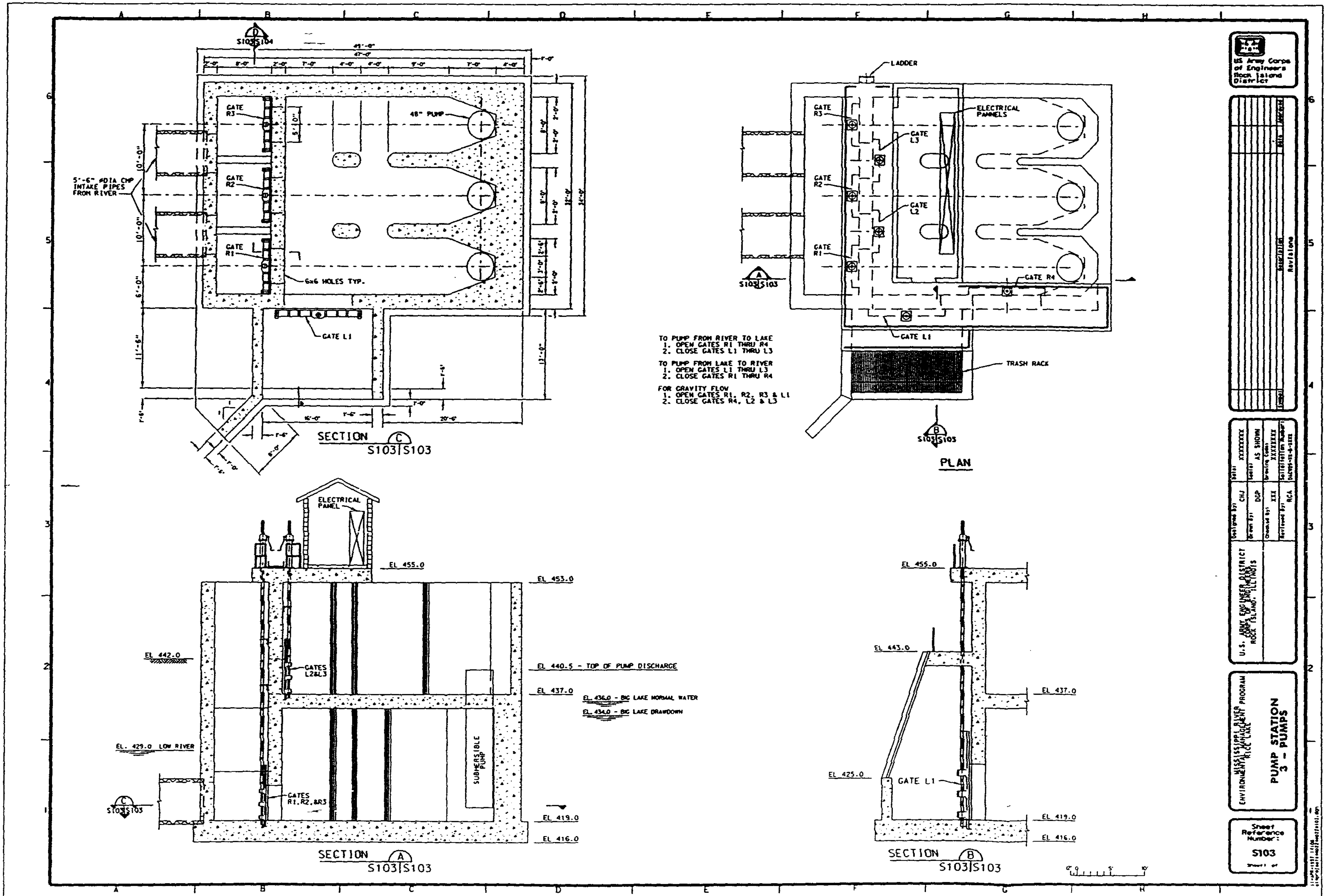

US Army Corps of Engineers Rock Island District
LADDER
GATE R3
GATE R2
GATE R1
GATE L1
GATE L2
GATE L3
GATE R4
48" PUMP
5'-6" ØDIA CMP INTAKE PIPES FROM RIVER
6x6 HOLES TYP.
ELECTRICAL PANNELS
TRASH RACK
TO PUMP FROM RIVER TO LAKE
1. OPEN GATES R1 THRU R4
2. CLOSE GATES L1 THRU L3
TO PUMP FROM LAKE TO RIVER
1. OPEN GATES L1 THRU L3
2. CLOSE GATES R1 THRU R4
FOR GRAVITY FLOW
1. OPEN GATES R1, R2, R3 & L1
2. CLOSE GATES R4, L2 & L3
SECTION C S103 S103
PLAN
ELECTRICAL PANEL
EL 455.0
EL 453.0
EL 442.0
EL 440.5 - TOP OF PUMP DISCHARGE
GATES L2&L3
EL 437.0
EL 436.0 - BIG LAKE NORMAL WATER
EL 434.0 - BIG LAKE DRAWDOWN
EL. 429.0 LOW RIVER
SUBMERSIBLE PUMP
GATES R1, R2, &R3
EL 419.0
EL 416.0
SECTION A S103 S103
EL 443.0
EL 425.0
GATE L1
SECTION B S103 S103
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS
MISSISSIPPI RIVER ENVIRONMENTAL MANAGEMENT PROGRAM RICE LAKE
PUMP STATION 3 - PUMPS
Sheet Reference Number: S103

PLATE 11

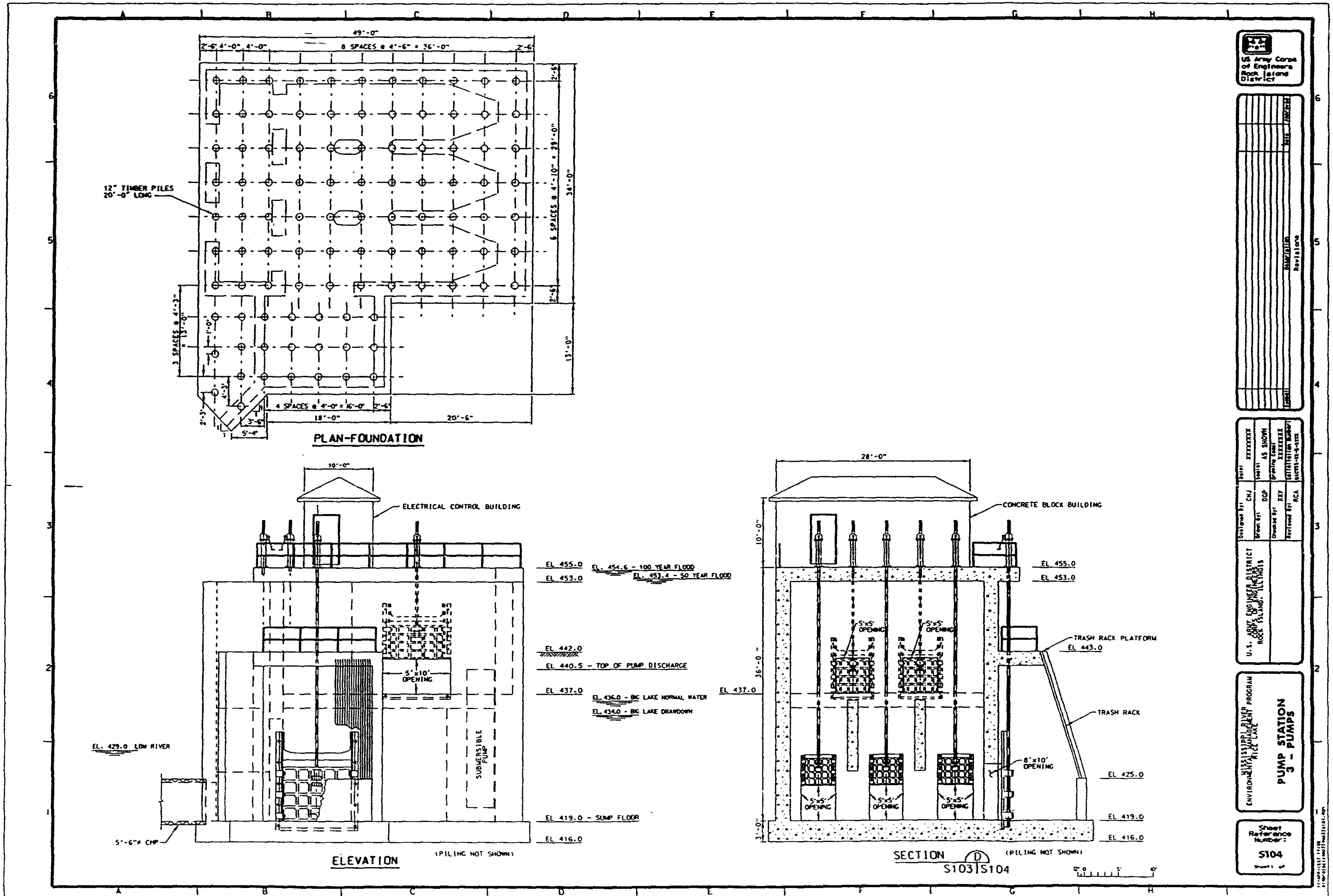
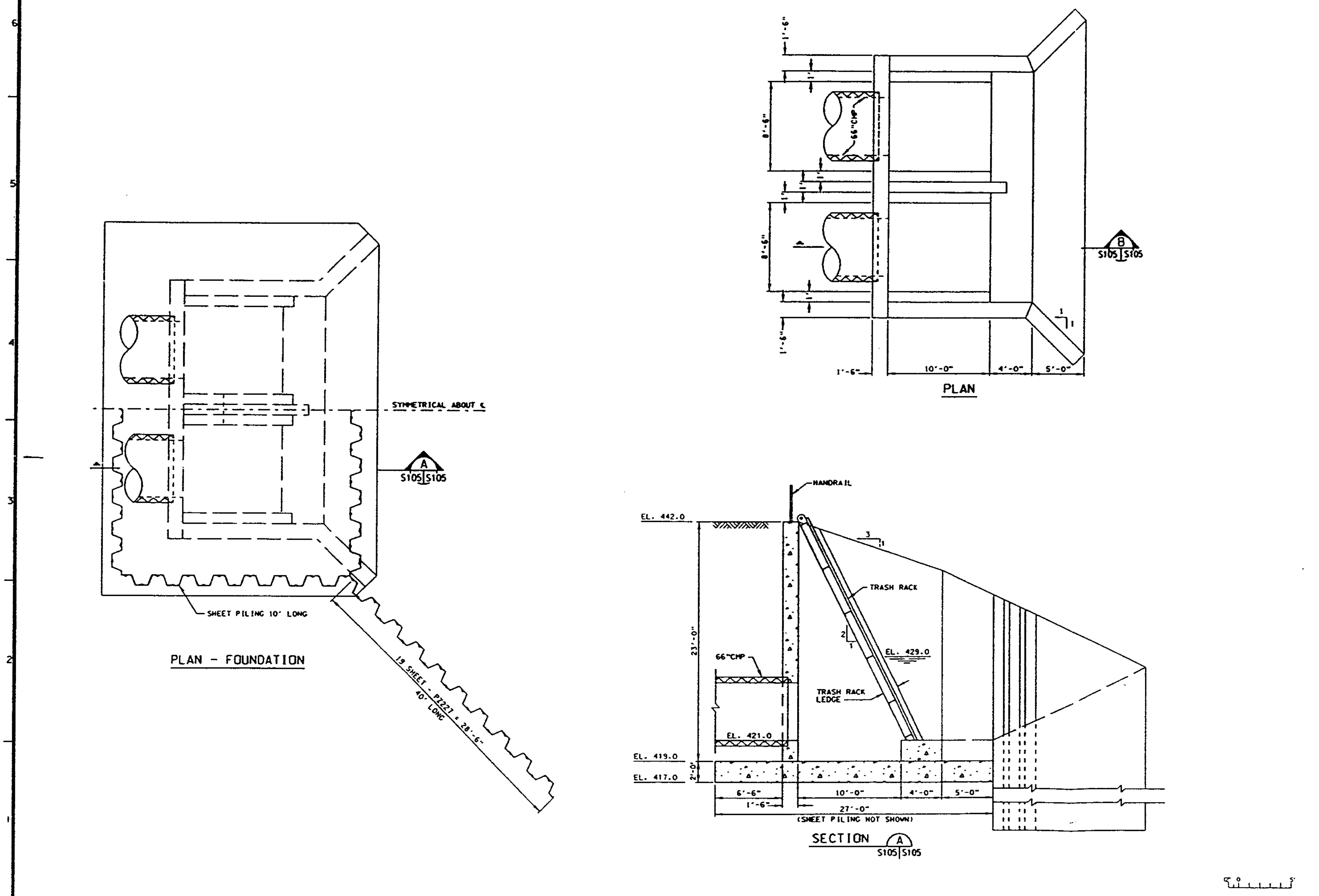

PLAN-FOUNDATION
49'-0"
8 SPACES @ 4'-6" = 36'-0"
12" TIMBER PILES 20'-0" LONG
6 SPACES @ 4'-10" = 29'-0"
34'-0"
13'-0"
3 SPACES @ 4'-3" = 13'-0"
4 SPACES @ 4'-0" = 16'-0"
18'-0"
20'-6"
5'-4"
ELEVATION
(PILING NOT SHOWN)
10'-0"
ELECTRICAL CONTROL BUILDING
EL 455.0
EL 453.0
EL. 454.6 - 100 YEAR FLOOD
EL. 453.4 - 50 YEAR FLOOD
EL 442.0
EL 440.5 - TOP OF PUMP DISCHARGE
5'x10' OPENING
EL 437.0
EL. 436.0 - BIG LAKE NORMAL WATER
EL. 434.0 - BIG LAKE DRAWDOWN
EL. 429.0 LOW RIVER
SUBMERSIBLE PUMP
EL 419.0 - SUMP FLOOR
EL 416.0
5'-6"⌀ CMP
SECTION D S103 S104
28'-0"
CONCRETE BLOCK BUILDING
5'x5' OPENING
TRASH RACK PLATFORM
EL 443.0
TRASH RACK
8'x10' OPENING
EL 425.0
EL 419.0
EL 416.0
US Army Corps of Engineers Rock Island District
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS
Designed by: CHJ
Drawn by: DGP
Checked by: XXY
Reviewed by: RCA
Date: XXXXXXXX
Scale: AS SHOWN
Drawing Code: XXXXXXXX
MISSISSIPPI RIVER ENVIRONMENTAL MANAGEMENT PROGRAM RICE LAKE
PUMP STATION 3 - PUMPS
Sheet Reference Number: S104

PLATE 12



US Army Corps of Engineers
Rock Island District

Symbol | Description | Date | Approved

Revisions

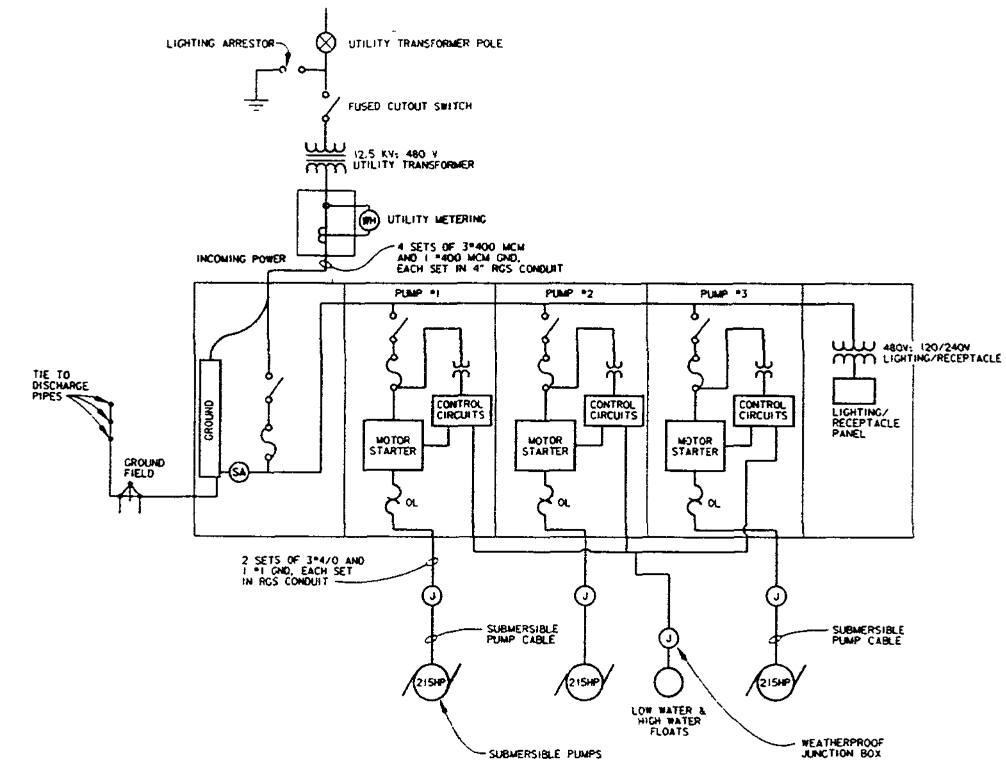
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

Designed by: CHJ	Date: XXXXXXXX	
Drawn by: DCP	Scale: AS SHOWN	
Checked by: XXX	Drawing Code: XXXXXXXX	
Reviewed by: RCA	Solicitation Number:	

MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
RICE LAKE

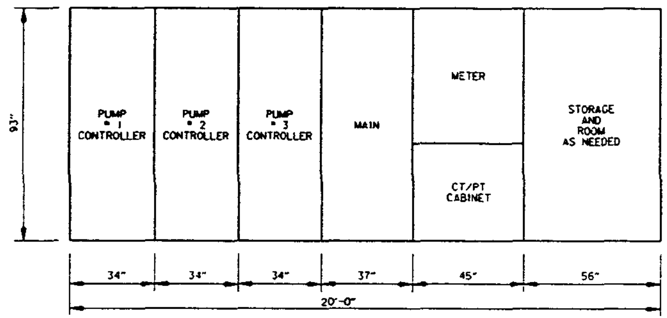
INTAKE STRUCTURES

Sheet Reference Number:
S105
Sheet 1 of

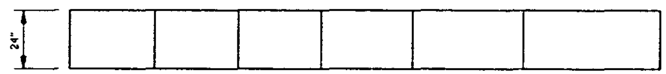


THREE 215 HP PUMPS
ONE-LINE DIAGRAM

NO SCALE



THREE 215 HP PUMPS
FRONT VIEW



TOP VIEW

MOTOR CONTROL CENTER

NO SCALE

US Army Corps
of Engineers
Rock Island
District

Symbol | Description | Date | Approved

Revisions

Designed by: RJW | Drawn by: DD | Checked by: RH | Reviewed by: JJC

Date: XXXXXXXX | Scale: AS SHOWN | Drawing Code: XXXXXXXX | Solicitation Number: DACW25-XX-B-XXXX

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

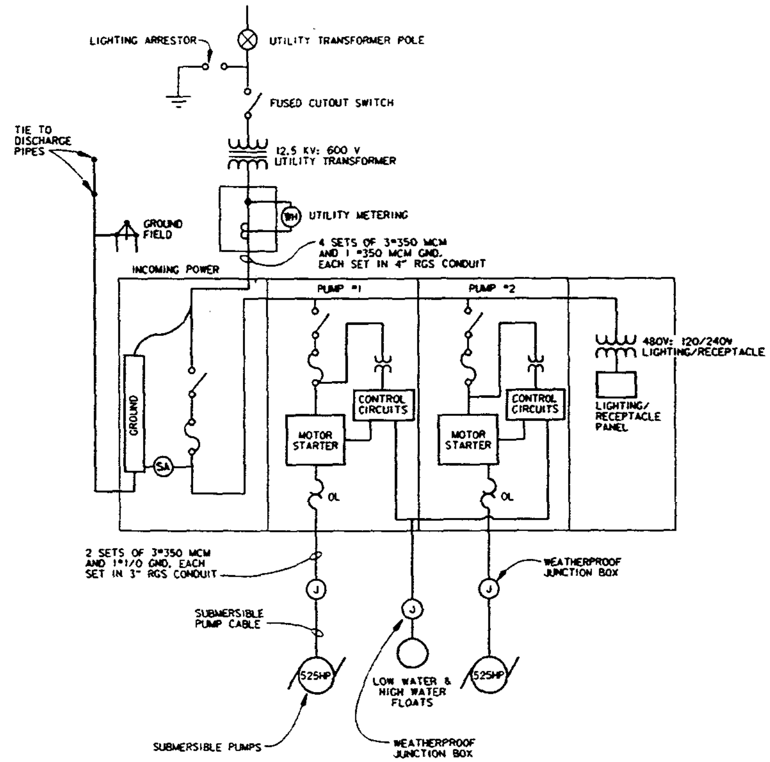
MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
RICE LAKE

3 - 215 HP PUMPS
ELECTRICAL

Sheet
Reference
Number:
E1

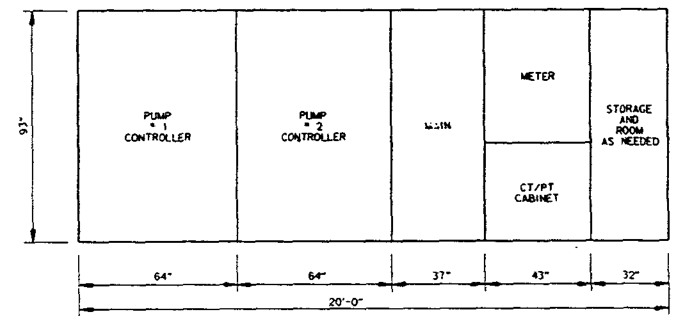
Sheet of

PLATE 14

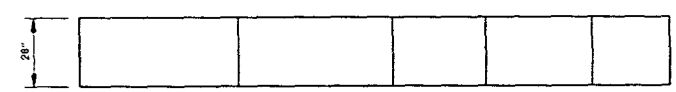


TWO 525 HP PUMPS
ONE-LINE DIAGRAM

NO SCALE



TWO 525 HP PUMPS
FRONT VIEW



TOP VIEW

MOTOR CONTROL CENTER

NO SCALE

US Army Corps of Engineers Rock Island District

Designed by: RJW	Date: XXXXXXXX
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Checked by: RH	Drawing Code: XXXXXXXX
Reviewed by: JJC	Solicitation Number: DACW25-XX-B-XXXX

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
RICE LAKE

2 - 525 HP PUMPS ELECTRICAL

Sheet Reference Number: E2

Sheet of

PLATE 15

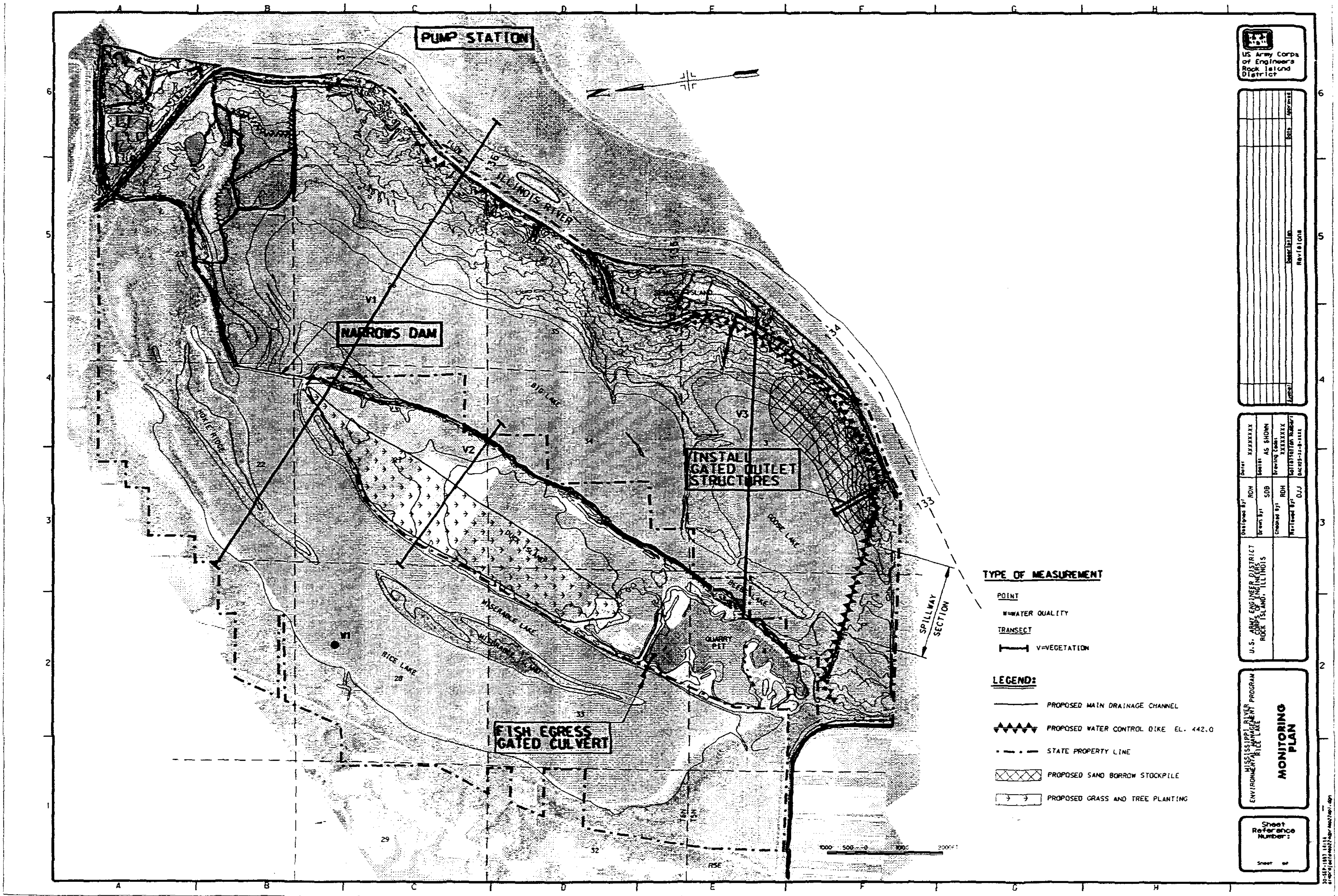
PUMP STATION
ILLINOIS RIVER
NARROWS DAM
BIG LAKE
V1
V2
V3
INSTALL GATED OUTLET STRUCTURES
RICE LAKE
W1
QUARRY PIT
FISH EGRESS GATED CULVERT
SPILLWAY SECTION
TYPE OF MEASUREMENT
POINT
W=WATER QUALITY
TRANSECT
V=VEGETATION
LEGEND:
PROPOSED MAIN DRAINAGE CHANNEL
PROPOSED WATER CONTROL DIKE EL. 442.0
STATE PROPERTY LINE
PROPOSED SAND BORROW STOCKPILE
PROPOSED GRASS AND TREE PLANTING
US Army Corps of Engineers Rock Island District
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS
MISSISSIPPI RIVER ENVIRONMENTAL MANAGEMENT PROGRAM RICE LAKE
MONITORING PLAN
Sheet Reference Number:

PLATE 16